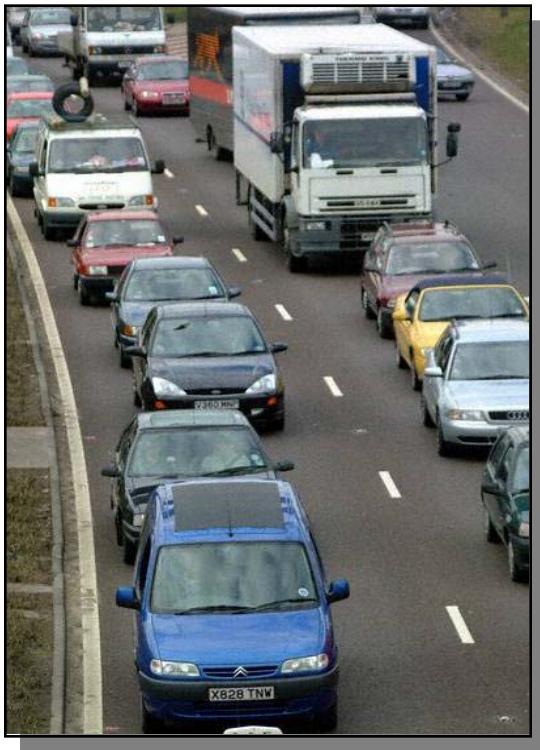# Presentation to:

Advisory and Stakeholders
Workshop #4

October 27, 2004

Study Purpose

- **To explore smart growth best practices and "new regionalism" opportunities**

- **Develop a comprehensive approach to guide growth and development within the San Joaquin Valley**

- **To develop the "toolbox" of land use and other models to enhance our regional planning efforts –** *transportation models cannot provide all the answers*

Presentation Overview

- **Previous Activity**
- **Why Change Modeling Practices?**
- **Alternative Scenarios – What are they?**
- **Overview of Three Model Types**
- **Smart Growth Indicators**
- **Model Benefits**
- **Next Steps to Model Refinement**
- **Potential Application of Tools**
- **Your Modeling Ideas**
- **Closing**
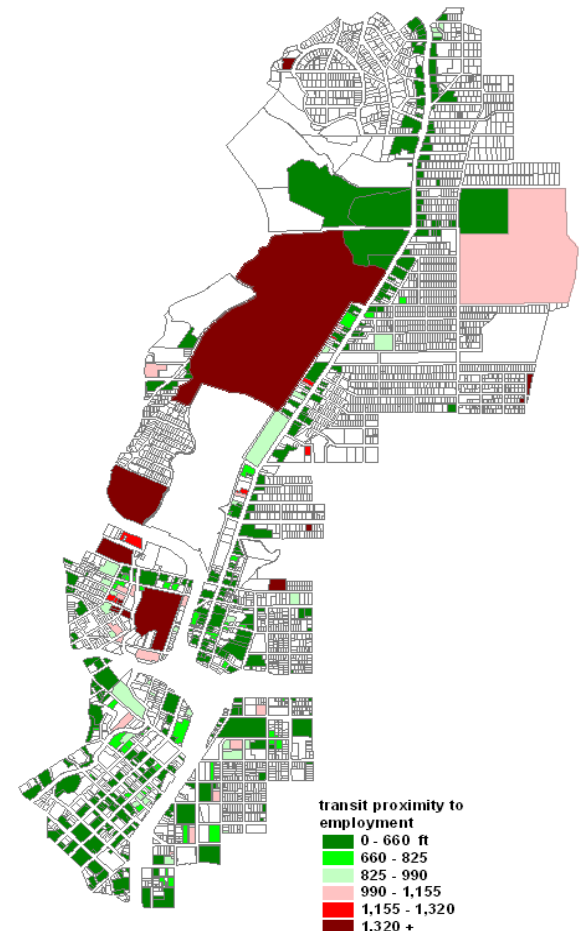- **Special Thank You**
- **Questions and Answers**

Previous Work Activity

- **Station 1 – Results of Phases I and II**
  - Mineta Institute Findings
  - Educational Component
  - Smart Growth Best Practices
  - Criteria for Selecting Transportation Models
  - Technical Framework for Modeling Smart

- **Station 2 – Phase III Modeling Inputs and Background**
  - Evaluation Process
  - Development of GIS Data
  - Smart Growth Indicators
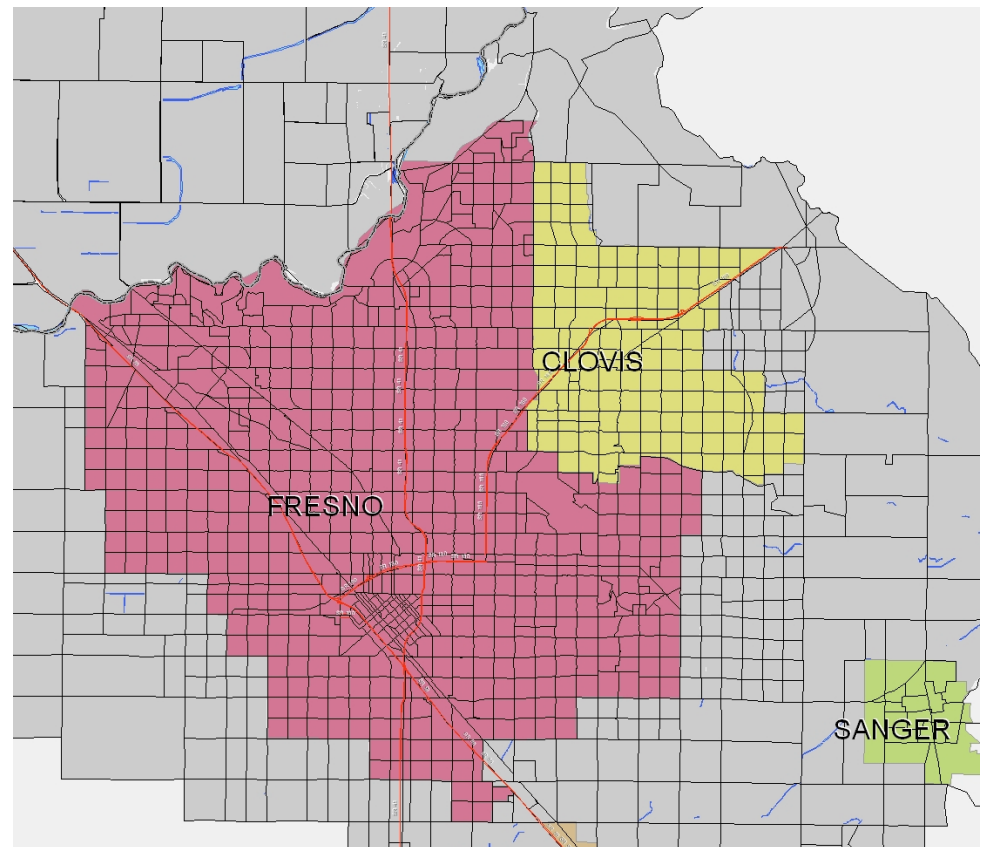 - Market Feasibility Analysis
  - Alternative Scenarios

transit proximity to employment

- 0 - 660 ft
- 660 - 825
- 825 - 990
- 990 - 1,155
- 1,155 - 1,320
- 1,320 +

Why Change Modeling Practices?

Fresno-Clovis Core Area - TAZ Pattern

■ **Standard Modeling Practices -**

- TAZ geography

- Demographic projection for household and job growth

- Inconsistent relationship to land use patterns
  - ◆ Existing
  - ◆ Policy

- Difficult to review with the public and decision-makers

Why Change Modeling Practices? (Cont.)

■ **Potential with New Modeling Tools -**

- <u>Parcel or block</u> geography

- Demographic projection for household and job growth <u>can be use-specific</u>

- Land use patterns as specific as available in GIS data
  - Existing
  - Policy

- Easier to review with the public and decision-makers
  - Maps look more real
  - Potential to "paint" alternatives interactively
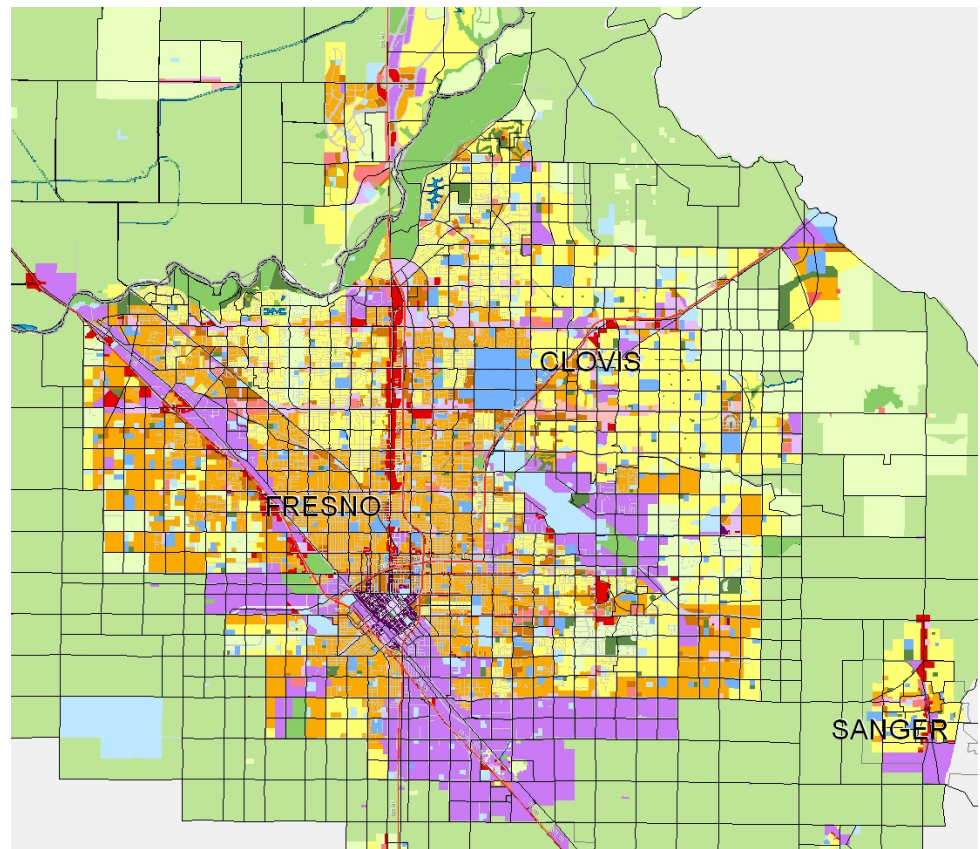
Fresno-Clovis Core Area - What If? Land Use Pattern

Alternative Scenarios – What Are They?

- **Initial Run Scenario**
  - Based on communities' General Plan land use policy - "Business-as-Usual"
  - "Build-out" City of Fresno to 2034 - provide additional housing in surrounding area to balance Fresno jobs

- **2 Alternative Scenarios**
  - Based on Workshop #3 polling results
  - Intensification Areas
    - Higher intensity land uses
    - Based on "marketable" mix of land uses
  - Introduction of high-capacity transit system
  - Lands outside of Intensification Areas keep Initial Run land use designations

Economics of Land Use

- **Modeling Process based on Economic Realities**
  - Not just a Visioning Exercise
  - Growth Forecast and Distributions reflect Real Estate Market Conditions
- **Strong Challenge given History, Lifestyles, Economy**
  - Central Valley dominated by Low Density, Affordable Living
  - Large number of households prefer Non-Urban Lifestyle

Housing Demand

- **Demand for Higher Density Development**

  - Geodemographics – age/ household size/ current residence/ jobs

  - Household Incomes – market-rate/ affordable

  - Location - new growth areas vs existing urbanized areas

- **Findings for Fresno/ Madera Region**

  - Significant Potential Interest: 12.5 percent of households
    (less than other regions)

  - Policy implications: require investments in urban areas and support for
    higher density development in a number of locations

Housing Development Feasibility

- **Financial Feasibility of Higher Density Development**

  - Potential Sales Prices given Competitive Supply

  - Development and Land Costs

  - Key Considerations: parking costs; entitlement risk; existing uses

- **Findings for Fresno/ Madera Region**

  - Competitive housing market makes feasibility a challenge

  - Possibilities in new growth areas; urban areas require public investment

  - Policy Implications: need active Redevelopment Agency involvement and supportive land use policies and policymakers

Initial Run Scenario

■ **Initial Run City of Fresno "Build-out"**

Time Period	Households	Jobs
2003	179,500	237,400
2025 Total Increment	282,400 +102,900 (37%)	399,800 +162,500 (69%)
"Build-out" Total Increment (2034)	311,900 +29,500 (10%)	496,900 +97,100 (20%)

General Plan Land Use
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
February 26, 2004

◦ **25,600 additional homes needed** to provide workers for all new jobs in Fresno; these are added to surrounding areas
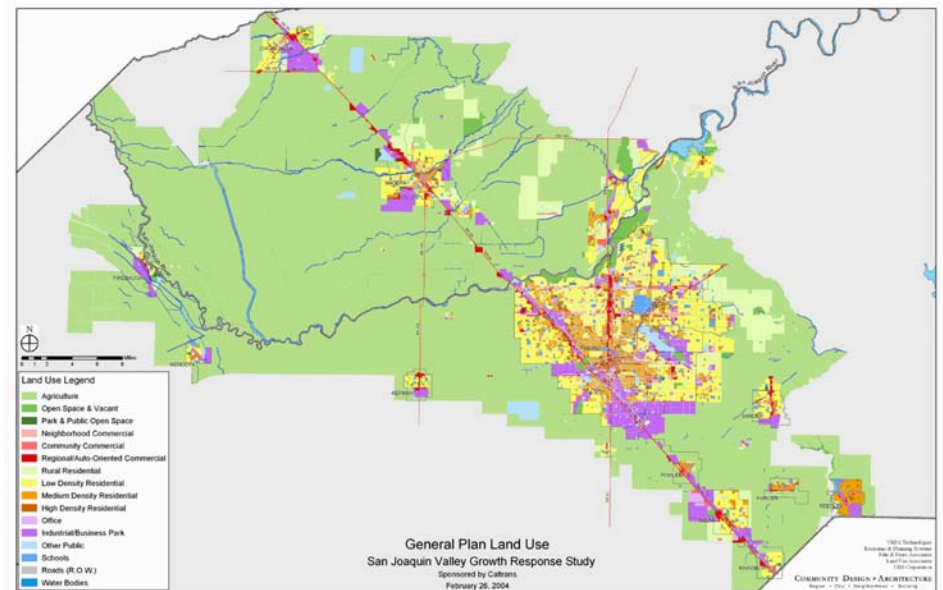
Alternative Scenarios Issues
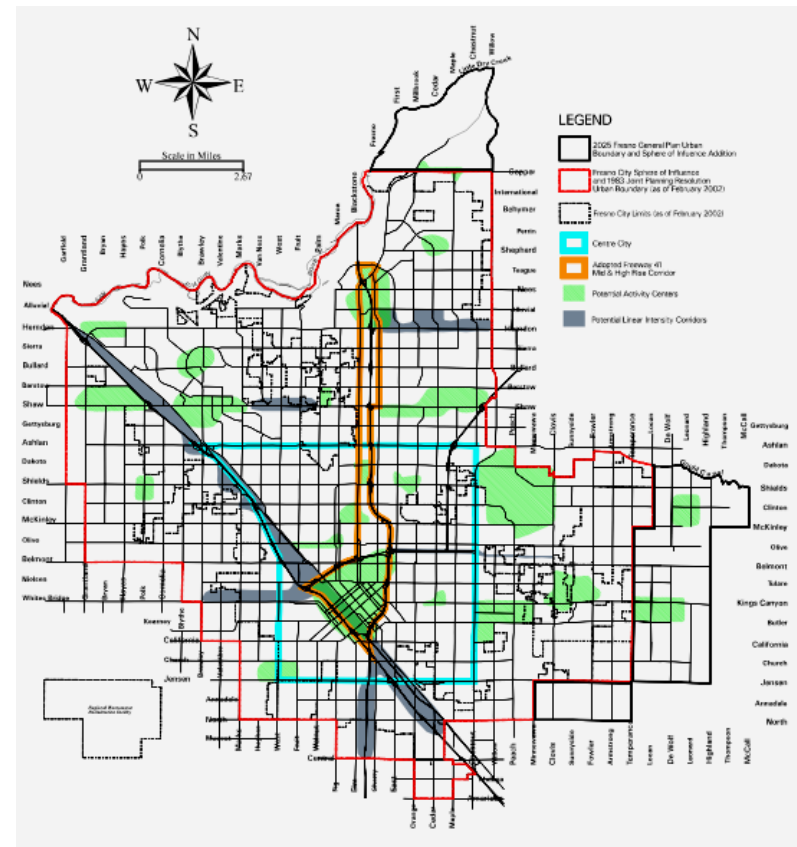
- **Issues explored in Alternative Scenarios —**
  - Infill and revitalization policies for cities and unincorporated communities;
  - Transit options with focused Transit-Oriented Development around stations and corridors -
    - Bus Rapid Transit
    - Light Rail
    - Monorail
    - Commute Rail
  - Policies to encourage distribution of jobs in proximity to concentrations of housing
  - Policies to encourage 20 to 30% increase in density for new growth, e.g. -
    - Low Density Residential @ 6 du/ac rather than 4.5 du/ac
    - Medium Density Residential @ 10 du/ac rather than 8 du/ac
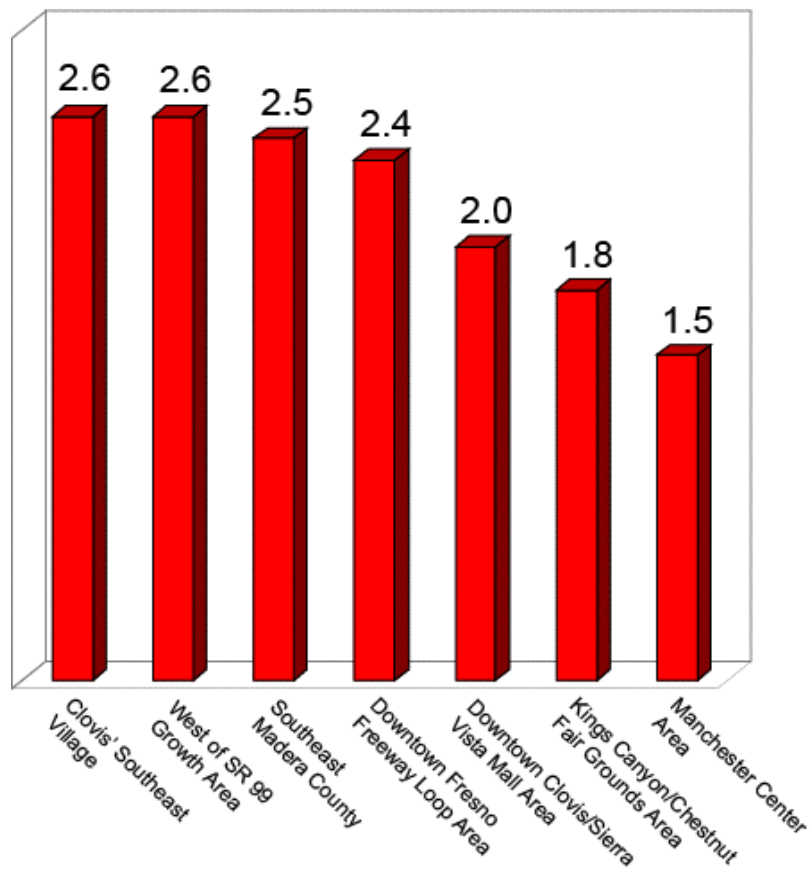   - High Density Residential @ 25 du/ac rather than 20 du/ac

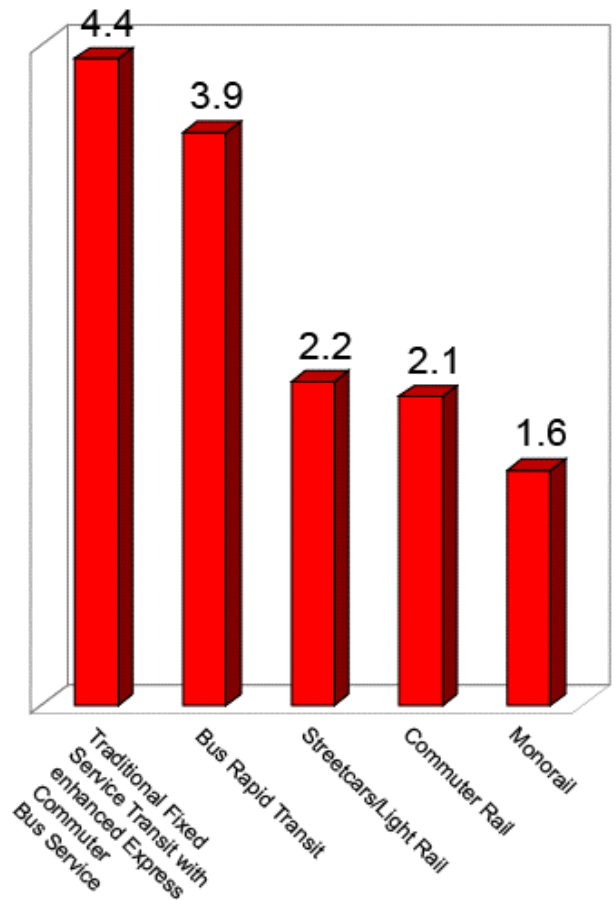City of Fresno General Plan Urban Form Components Map

Alternative Scenarios Issues (Cont.)

- Used polling in Workshop #3 to explore preferences regarding
  - Potential intensification areas;
  - Potential high-capacity transit corridors; and,
 - Methods for increasing intensities and land use mixes.

Chart 1 (Intensification Areas):

Area	Value
Clovis' Southeast Village	2.6
West of SR 99 Growth Area	2.6
Southeast Madera County	2.5
Downtown Freeway Loop Area	2.4
Downtown Fresno Vista Mall Area	2.0
Downtown Clovis/Sierra Fair Grounds Area	1.8
Kings Canyon/Chestnut Manchester Center Area	1.5

Chart 2 (Transit Corridors):

Mode	Value
Traditional Fixed Service Transit with enhanced Express Commuter Bus Service	4.4
Bus Rapid Transit	3.9
Streetcars/Light Rail	2.2
Commuter Rail	2.1
Monorail	1.6

Alternative Scenarios Development

Alternatives to the Initial Run

- Based on Workshop #3 Polling Results

- Preferred Network and Intensification Areas:
  - Blackstone Corridor
  - Downtown Fresno
  - Kings Canyon corridor to SE Fresno
  - SE Madera New Towns
  - Clovis Jensen to Herndon

- Land uses with greater densities & mix than current General Plan designations

- Connected by high capacity/high speed transit network
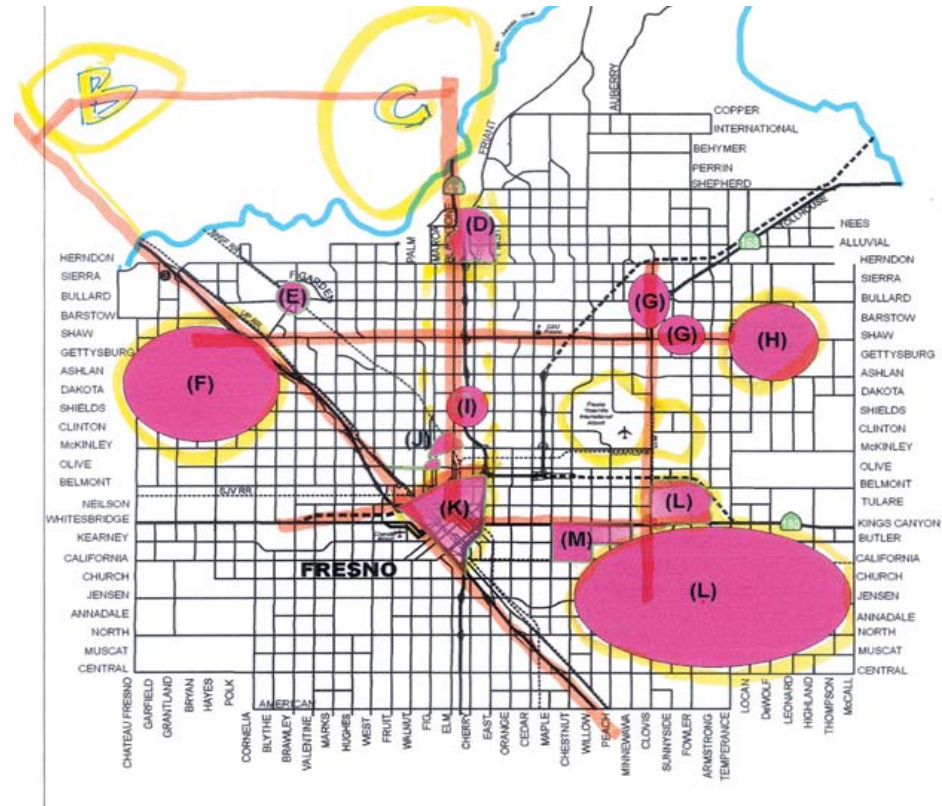
Preferred Transit Network & Intensification Areas
Based on Workshop #3 Input

Alternative Scenario #1

- **Blackstone/41-Downtown Fresno Scenario (Alt. 1)**
  - "Fixed guideway" transit routes:
    - Blackstone/41
    - Ventura/Kings Canyon
  - Intensification Areas focused on transit corridors:
    - Blackstone Corridor
    - Downtown Fresno
    - Kings Canyon corridor to Southeast Fresno
    - SE Madera New Towns
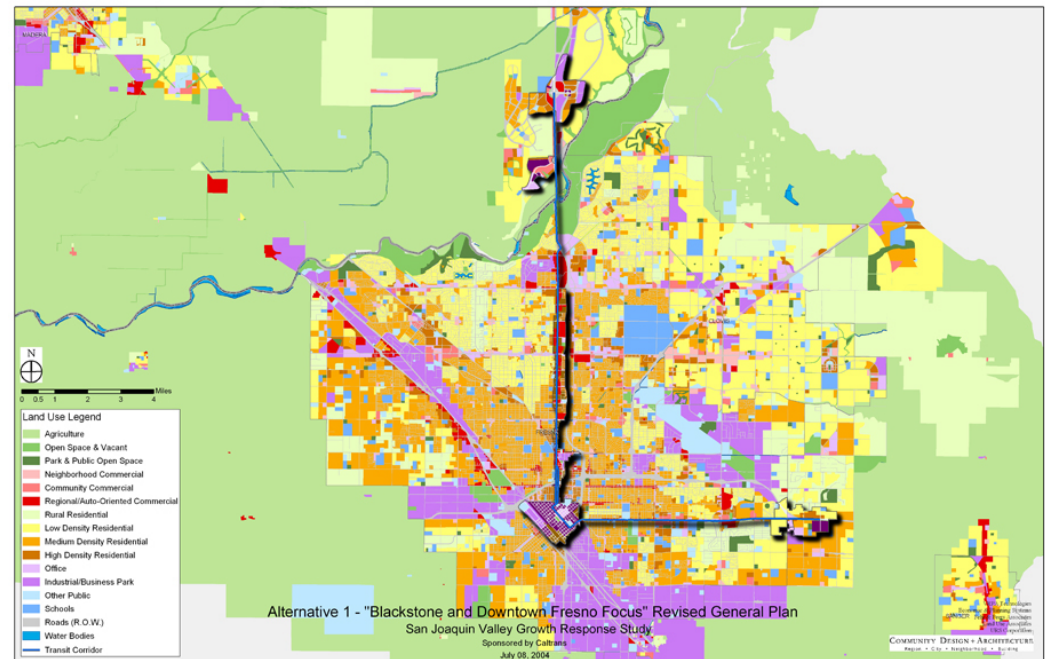

Blackstone/41 & Southeast Fresno Corridors Intensification Areas

Alternative Scenario #2

■ **High-Capacity Transit Network Scenario (Alternative 2)**

- High-capacity transit mainly in dedicated lanes:
  - Blackstone/41
  - Ventura/Kings Canyon
  - Shaw - east of Blackstone
  - Clovis - Kings Canyon to Shaw
- Intensification Areas:
  - Blackstone Corridor
  - Downtown Fresno
  - Fancher Creek & Southeast Fresno
  - Clovis Shaw Corridor & Southeast Urban Center
  - Whitesbrigde Corridor
  - Southeast Madera New Towns
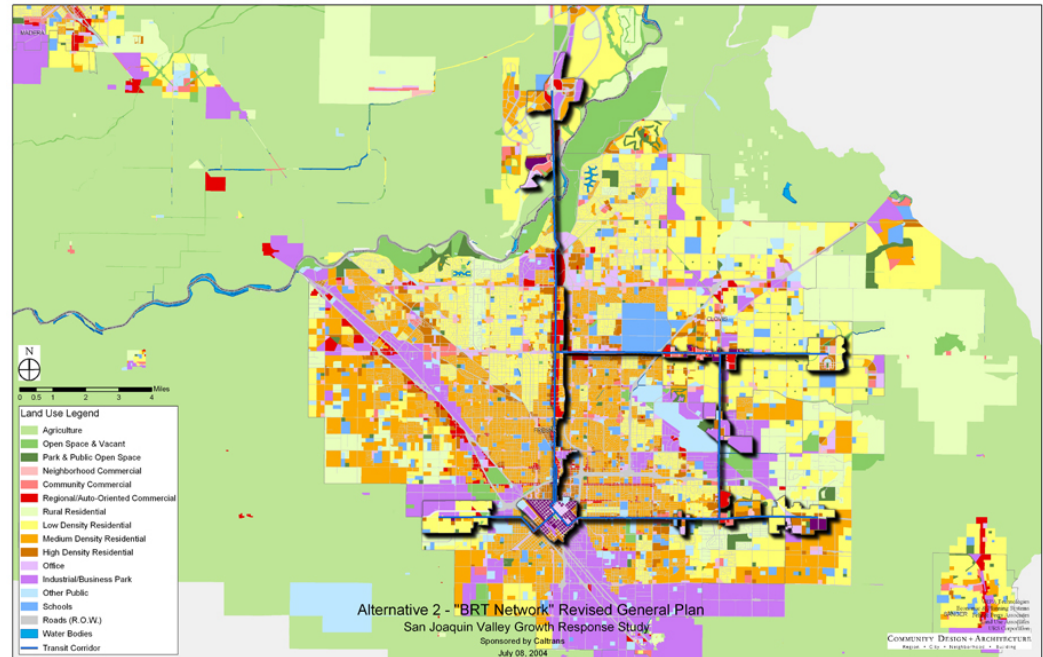
High-Capacity Transit Network and Intensification Areas

Alternative Scenarios - Intensification Prototypes

	Initial Run	Alternatives
RESIDENTIAL		
Low	4.5 du/ac	6 to 8 du/ac
Medium	8 du/ac	10 to 20 du/ac
High	20 to 26 du/ac	24 to 36 du/ac
Very High	Not available	45 to 80 du/ac
EMPLOYMENT		
Industrial	10.65 emp/ac	40 emp/ac
Bus. Park	10.65 emp/ac	38 to 60 emp/ac
Office	48.53 emp/ac	50 to 120 emp/ac

Alternative Scenarios - Transit Prototypes

Light Rail/Monorail (proposed for *Alternative 1-Blackstone/41*)	
Headways	5 minutes (peak) 10 minutes (off-peak)
Line Speed	= Auto free flow speed
Basic Bus	As in Initial Run

Bus Rapid Transit (BRT) (proposed for *Alternative 2-BRT Network*)	
Headways	2.5 minutes (peak) 5 minutes off-peak
Line Speed	80% of auto
Basic Bus	As in Initial Run
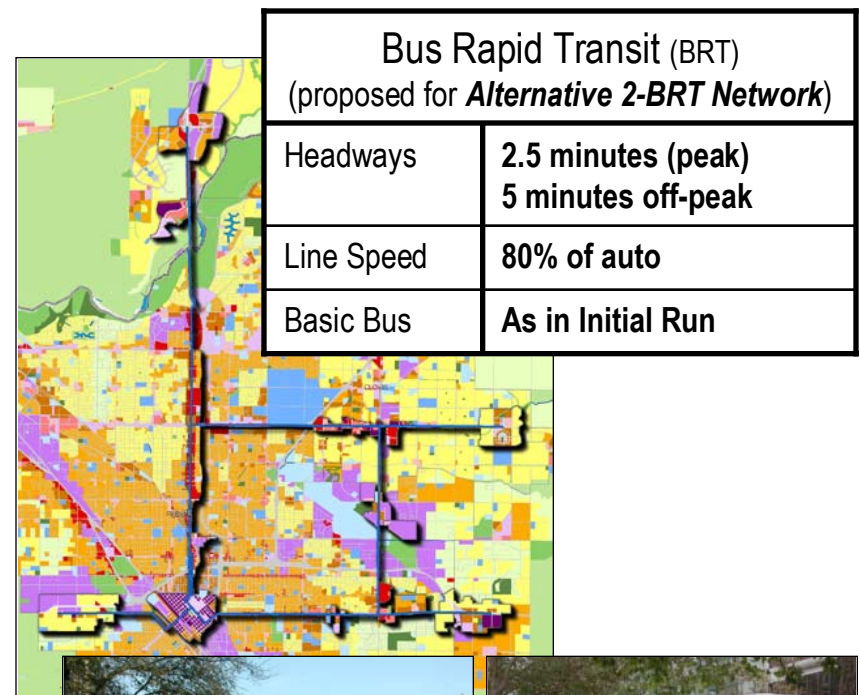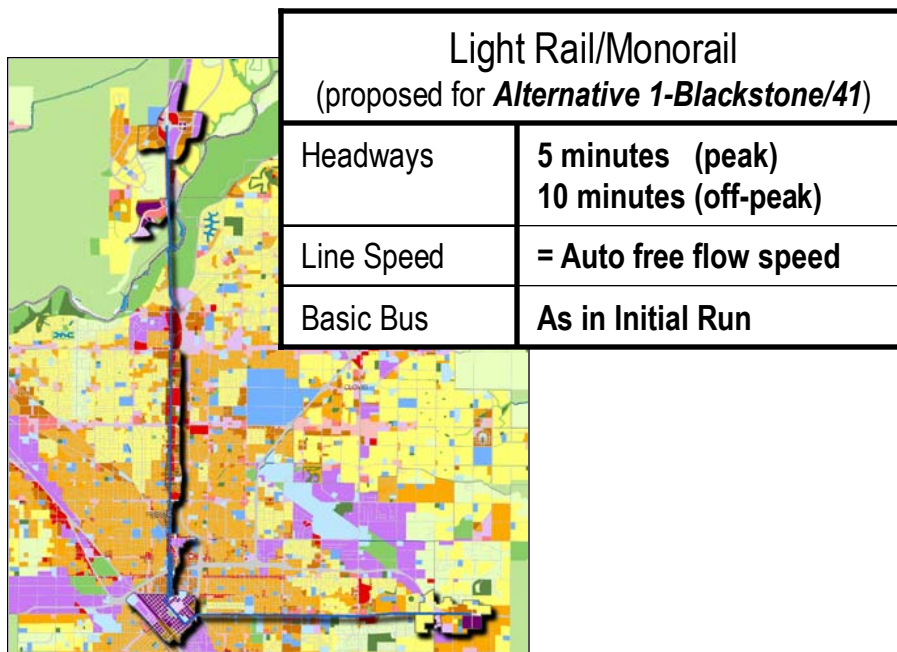
San Joaquin Valley Growth Response Study, Phase III

Example Intensification of a Corridor

Emphasis on Mixed-use with First Floor Retail

Emphasis on Mixed-use with First Floor Neighborhood-Serving Retail

Emphasis on Mixed-use with First Floor Community-Serving Retail

Emphasis on Residential or Residential with Community Uses on First Floor

Emphasis on Mixed-use with First Floor Retail and Residential Above

SOUTHERN DOWNTOWN DISTRICT

McKINLEY RESIDENTIAL DISTRICT

PALMA DISTRICT

INTERNATIONAL & CULTURAL DISTRICT

GATEWAY DISTRICT

East 14th Street, San Leandro, CA

Example Infill Site

East 14th Street, San Leandro, CA

Simulation by Urban Advantage

Example Infill Site

East 14th Street, San Leandro, CA

Simulation by Urban Advantage

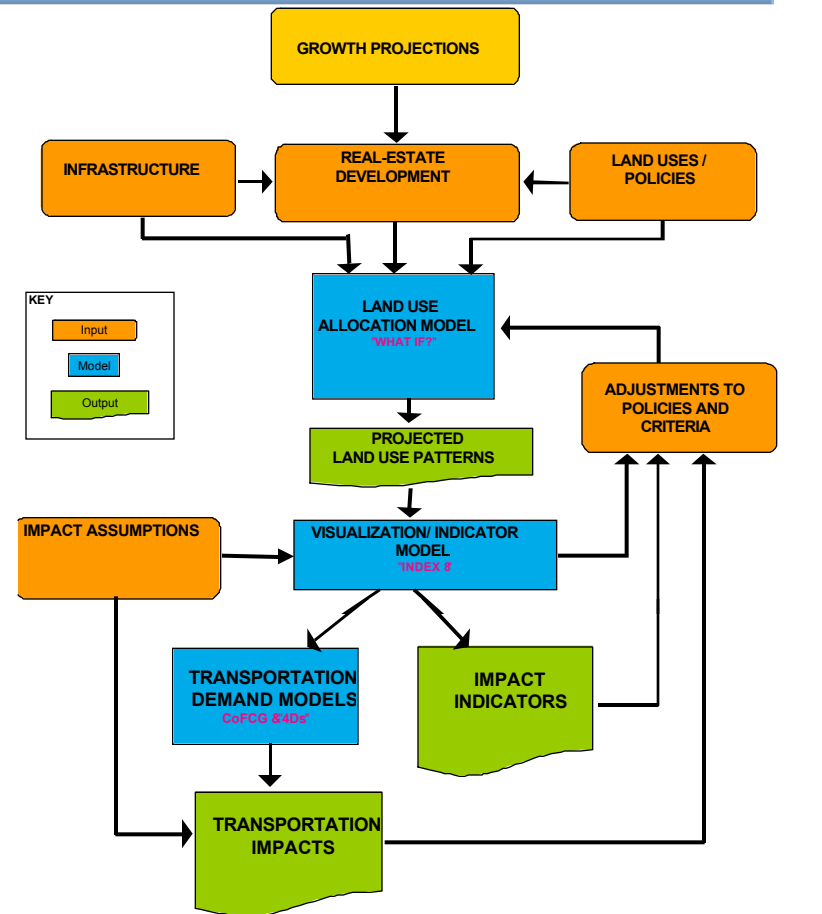# Overview of Three Model Types

Land Use Allocation Models

- Map existing and future land use & transportation patterns
- Define additional assumptions and directions for growth
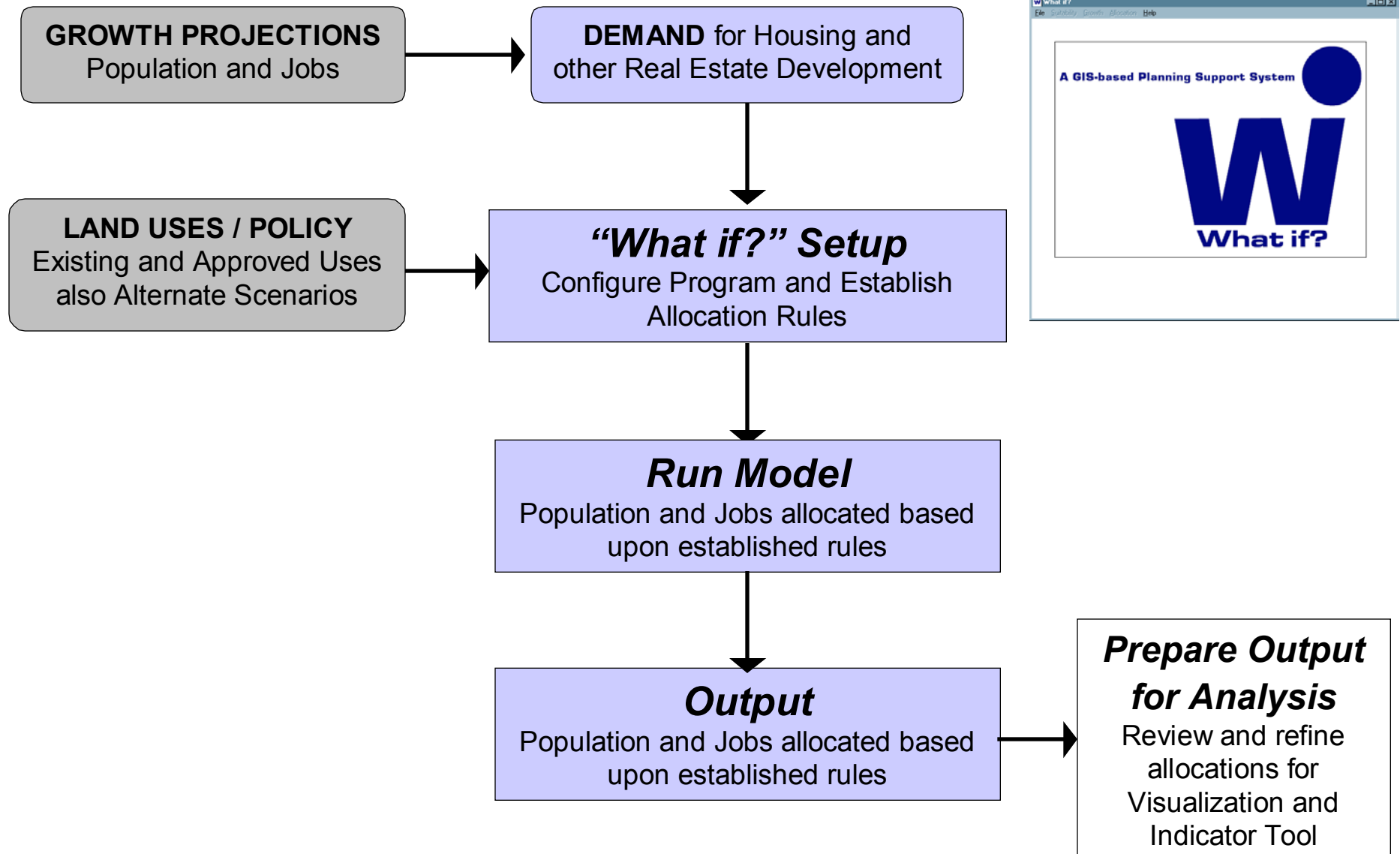
Indicator/Visualization Models

- What will the effects of growth be under alternative development plans?
- Allows scenario testing — comparisons to baseline/business-as-usual conditions

Transportation Model Enhancements

- Enhance Fresno/Madera Region's existing transportation and air quality models

KEY
- Input
- Model
- Output

GROWTH PROJECTIONS

INFRASTRUCTURE → REAL-ESTATE DEVELOPMENT ← LAND USES / POLICIES

LAND USE ALLOCATION MODEL 'WHAT IF?'

ADJUSTMENTS TO POLICIES AND CRITERIA

PROJECTED LAND USE PATTERNS

IMPACT ASSUMPTIONS → VISUALIZATION/ INDICATOR MODEL 'INDEX 8'

TRANSPORTATION DEMAND MODELS CoFCG &4Ds'

IMPACT INDICATORS

TRANSPORTATION IMPACTS

*Models in blue boxes

The "What if?" Land Use Allocation Process

GROWTH PROJECTIONS
Population and Jobs

DEMAND for Housing and other Real Estate Development

LAND USES / POLICY
Existing and Approved Uses also Alternate Scenarios

"What if?" Setup
Configure Program and Establish Allocation Rules

Run Model
Population and Jobs allocated based upon established rules

Output
Population and Jobs allocated based upon established rules

Prepare Output for Analysis
Review and refine allocations for Visualization and Indicator Tool

A GIS-based Planning Support System

wi

What if?

Primary Study Area

- **Major urban areas of Fresno and Madera County**
  - Fresno - Clovis urban center
  - Hwy. 99 Corridor Cities
  - Southeastern Fresno County Communities
  - San Joaquin River Communities
- **2003 Demographics**
  - 85% of regional population
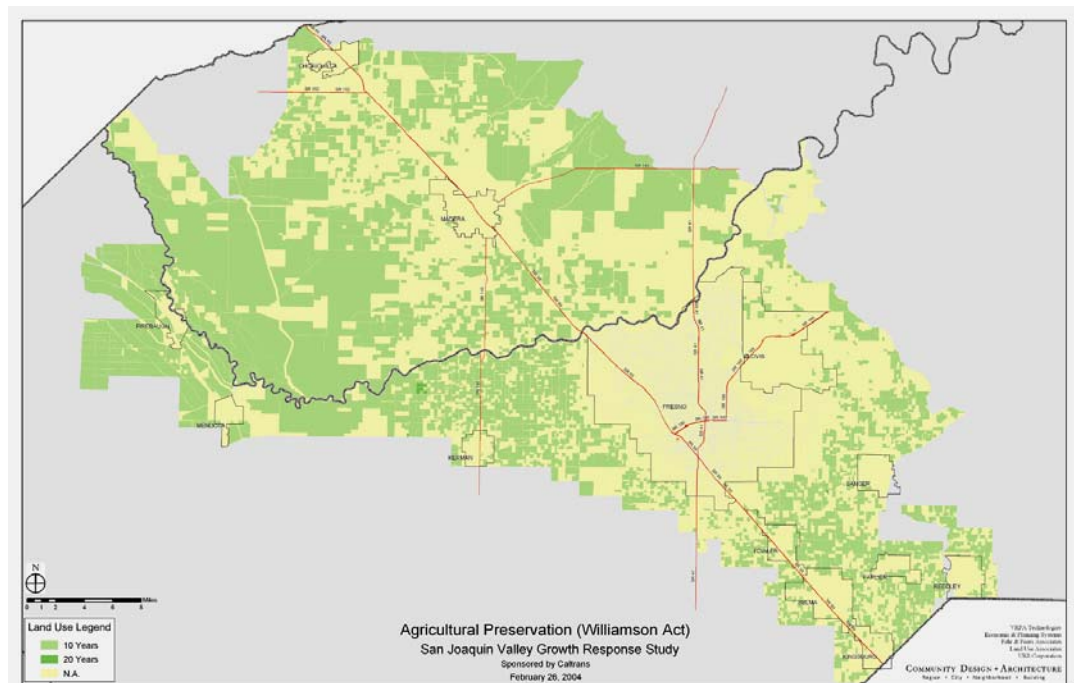 - 97% of regional jobs
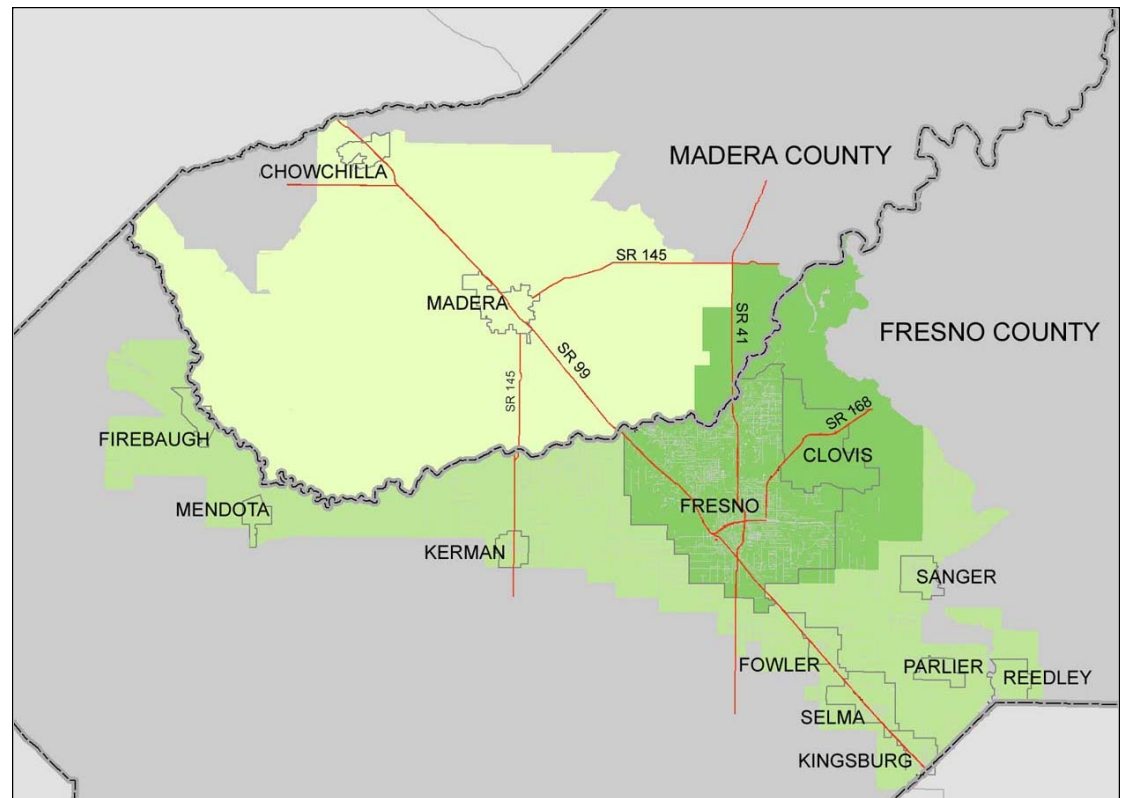
Primary Study Area

"What if?" Land Allocation Model

■ **"Suitability" Parameters**

- **Agricultural preserved lands**
- Vacant lands
- Slopes
- Soils
- Growth Patterns

Agricultural Preservation (Williamson Act)
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
February 26, 2004

"What if?" Land Allocation Model (Cont.)

■ **"Suitability" Parameters**

- Agricultural preserved lands

- Vacant lands

- Slopes

- Soils

- **Growth Patterns within communities**

Community Growth Pattern
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
February 26, 2004
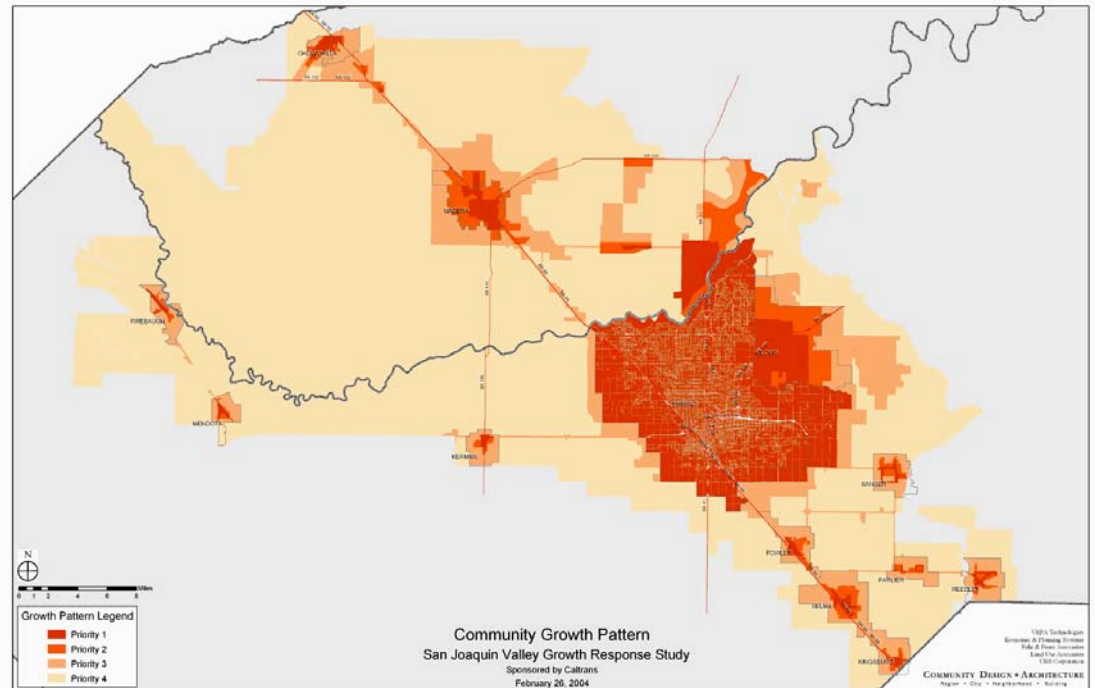
INDEX Evaluation Model

- **Measuring the success of each Alternative Scenario**
  - Evaluating indicators of success

- **Results from land use allocation model input into INDEX**

- **Allows visual and numerical comparisons of Alternative Scenario performance**
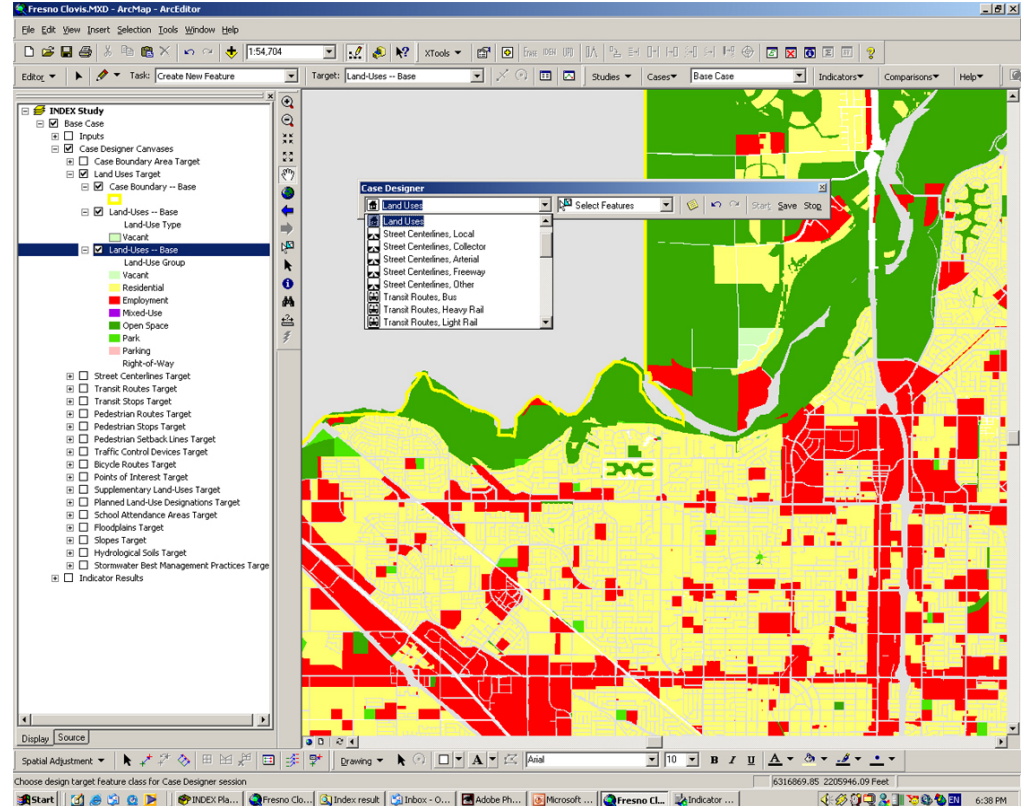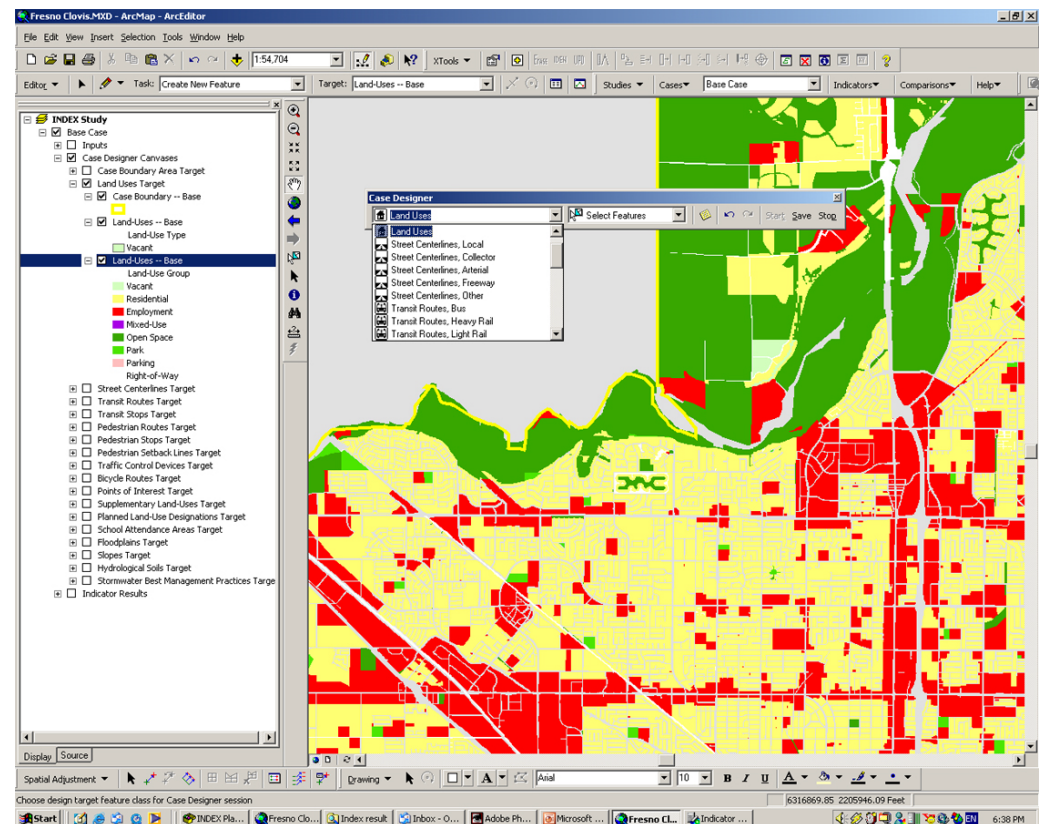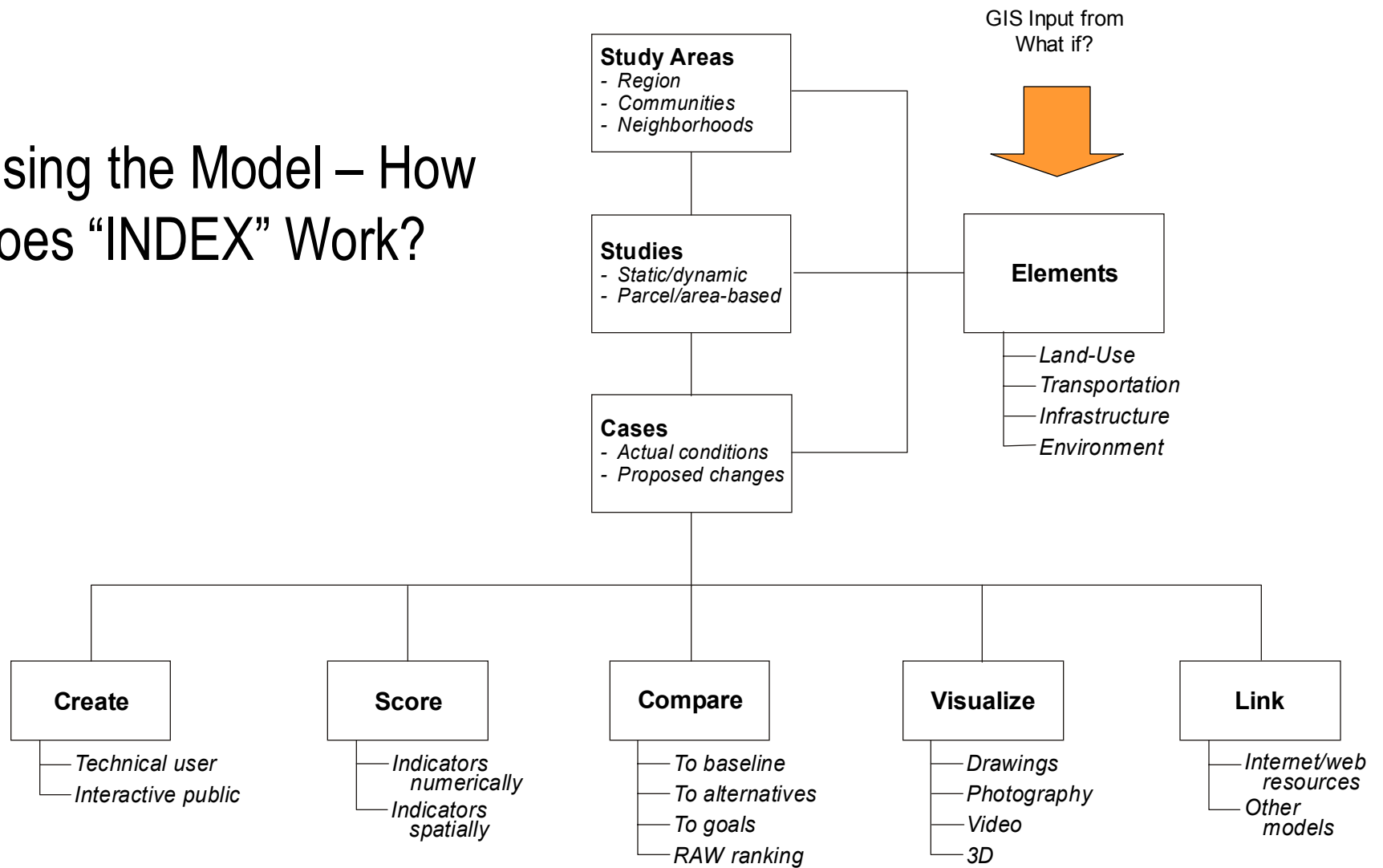
Roles for INDEX in Planning & Monitoring

- **Assess performance at different stages of planning and implementation:**
  - Existing conditions
  - Existing policies
  - Alternative scenarios
  - Monitor performance of implementation
    - Overtime
    - Against benchmarked goals

Using the Model – How does "INDEX" Work?

Study Areas
- *Region*
- *Communities*
- *Neighborhoods*

GIS Input from
What if?

Studies
- *Static/dynamic*
- *Parcel/area-based*

Elements
— *Land-Use*
— *Transportation*
— *Infrastructure*
— *Environment*

Cases
- *Actual conditions*
- *Proposed changes*

Create
— *Technical user*
— *Interactive public*

Score
— *Indicators numerically*
— *Indicators spatially*

Compare
— *To baseline*
— *To alternatives*
— *To goals*
— *RAW ranking*

Visualize
— *Drawings*
— *Photography*
— *Video*
— *3D*

Link
— *Internet/web resources*
— *Other models*

Transportation Modeling: Principles, Assumptions, Methods & Goals

- **Build on Fresno COG and MCTC TP+ models assumptions and data as fully as possible**

  - Each updated to 2003 conditions in terms of basic land use and transportation networks

  - 2025 models used for network and other key assumptions regarding 2034

- **Translate What If? Acreage forecast in TP+ HH and Employment Forecast**

- **Enhance sensitivity to local land use (the 4 Ds ← more later)**

TP + and the 4Ds

- **Both Fresno COG & Madera CTC have "conventional" TP+ four-step models**

  - Generate trip "Productions" based on Household travel surveys

  - Distribute trips based on location of trip "Attractions"

  - Determine Choice of Travel Mode

    - Fresno COG Model only; MCTC model is vehicle trips only

  - Assign Trips to the Network

- **TP+ is most used software package in the San Joaquin Valley**

- **Like all models, structurally insensitive to local land use features, hence the need for the 4D process**

TP Modeling Challenges

250%

235%

200%

150%

100%

50%

70%

0%

22%

Population **Driving** **Highway Delay**
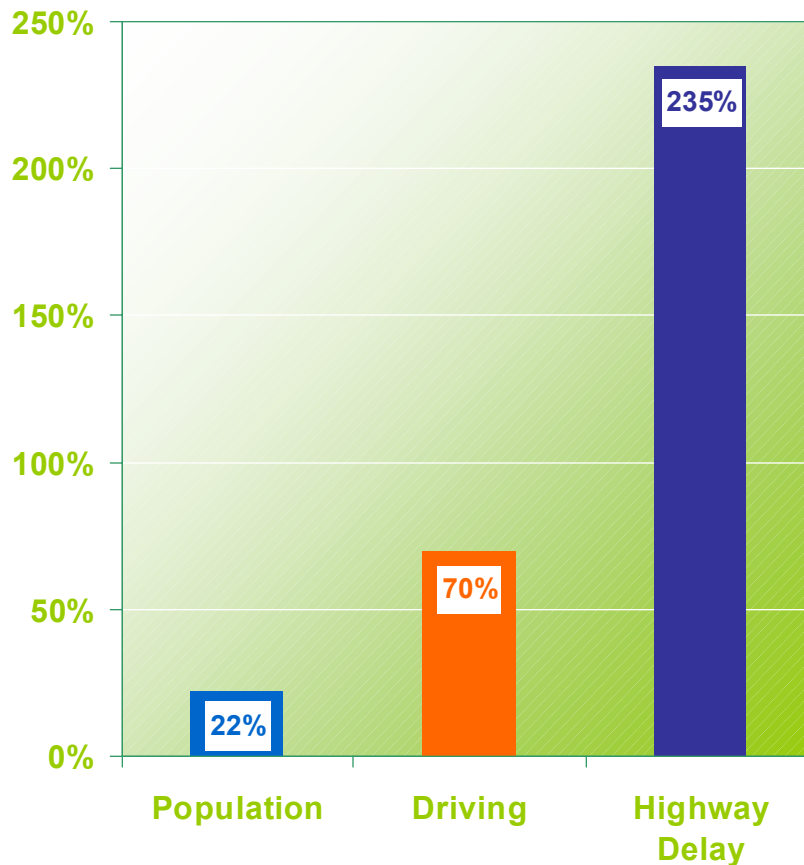
Assume – or modify – trends?

Population:

Up 22%

Driving:

Up 70%

Highway Delay:

Up 235%

Fresno region has bucked these trends somewhat

Model Inputs

LANDUSE.DBF			
TAZ	SF	MF	EMP
848			
1025			
1024			

- **Land Use/Socioeconomic Data**
  - Based on Travel Analysis Zones (TAZs)
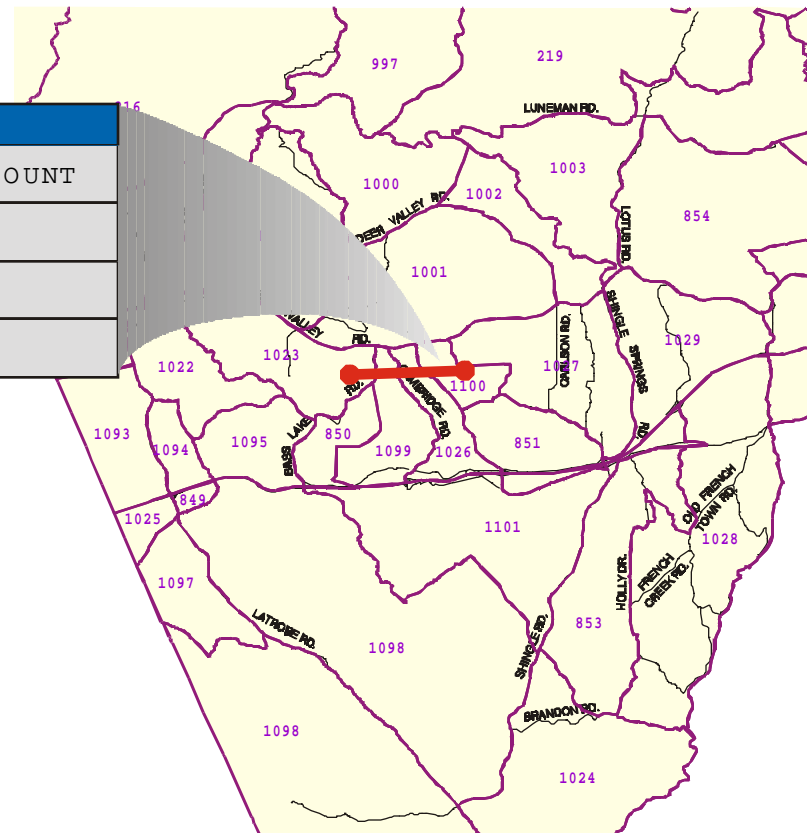- **Roadway Network Data**
- **Travel Characteristics Data**
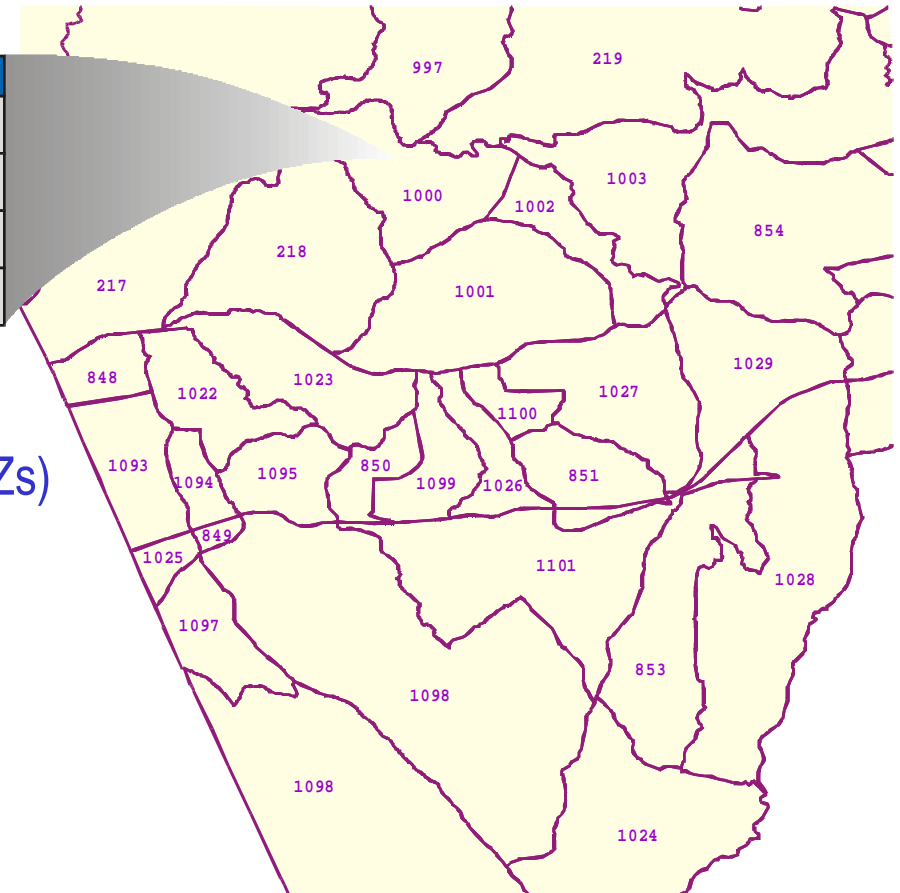
Model Inputs (Cont.)

LINKS.DBF				
LINK	SPEED	DIST	LANES	COUNT
848–1025				
1025–1024				
1024–848				

- **Land Use/Socioeconomic Data**

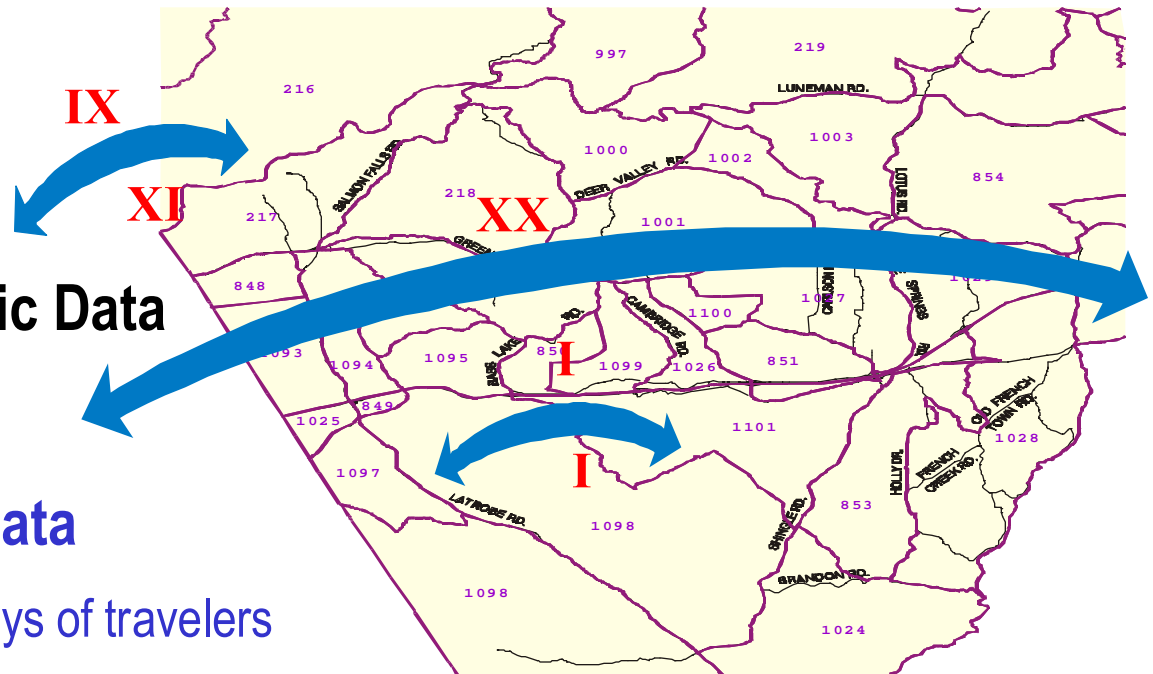- **Roadway Network Data**

- **Travel Characteristics Data**

Model Inputs (Cont.)

- **Land Use/Socioeconomic Data**

- **Roadway Network Data**

- **Travel Characteristics Data**

  - In the end, based on surveys of travelers

  - Must include assumptions about trips that are both internal and external to the study area

4Ds: Capturing Local Land Use Impacts on Travel

- **Many factors affect travel demand that are not easily reflected in traditional four-step models, e.g., due to scale of the TAZs**

- **Focusing on land use, we may speak of several "D-factors" that at the neighborhood scale, shift travel demand away from driving**

  - Density

  - Diversity (complementary mixing of land uses)

    - Sacramento studies suggest that nearby retail and personal services are especially effective in reducing midday trips and trips to and from work

  - Design (to encourage walking and biking)

  - Destinations (how many attractions are you near?)

- **The TP+ modeling process was adjusted to account for the 4Ds**

Density, Diversity, Design…

- **Compact uses**

- **Synergy through mix of use**

- **Trip linking opportunities**

- **Pedestrian, bicycle oriented**

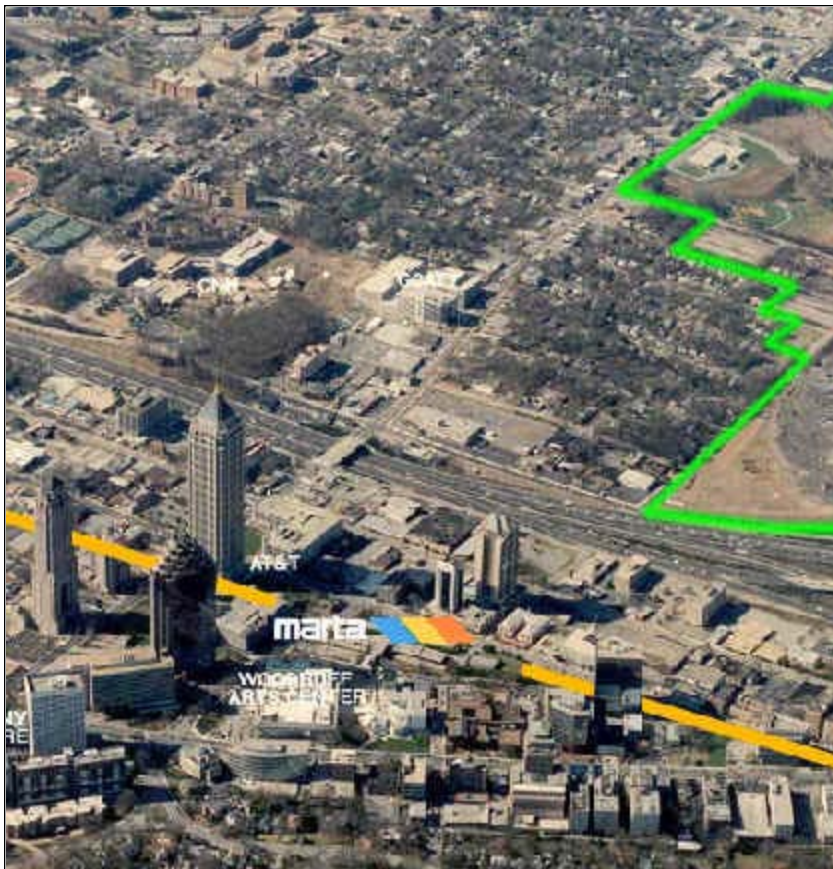- **Interconnected multimodal streets**

- **Walkable destinations**

Density, Diversity, Design… (Cont.)

…Destinations & a fifth D, Distance to Transit

4-D Elasticities

Percent change in trip generation by trip purpose given a 100% change in each of four key land use variables for a given TAZ

4D Elasticites (from Sacramento Region household survey	Net Res. Density	Net Emp. Density	Job-mix Index	Design Index
Trip Purpose				
Home Based Non-Work	-7.0 %		-	- 3.2 %
Home Based Work	-		-	-
Non-Home-Based		-33.9 %	-46.2 %	-

Smart Growth Indicators

- **Purpose: To display the impacts of land use patterns**
  - Examples of Indicators:
    - Population Density
    - Percent of dwellings within 1/4 mile of transit
  - Enables comparison of Alternative Scenarios in terms of their success in meeting stakeholder goals
  - Narrowed list of potential indicators down to **13** to address key community concerns

- **Worked with stakeholders, elected officials, interest groups, government agencies and general public to define indicators important to the region**

Smart Growth Indicators (Cont.)

- **13 Selected Indicators:**

  1. Developable land remaining after new growth
  2. Acres of agriculture remaining
  3. Development Footprint (combined measurement of infill and density of population and employment)
  4. Population density
  5. Employment density
  6. Use Mix

  7. Transit Adjacency to Housing
  8. Transit Adjacency to Employment
  9. Mode split to transit
  10. Vehicle miles traveled
  11. Vehicle hours traveled
  12. Economics of Development
  13. Air pollution (NOx, HC, CO, & CO2) emitted from light vehicles

Smart Growth Indicators (Cont.)

| Indicator #	Indicator Categories/Indicators	Indicators Directly Available From Models	Candidates for Economic & Environ. Justice	Status	Related General Plan Policies City of Clovis	City of Fresno	Fresno County	Madera County
1	*Economics*					*	*	*
a	Travel cost ($/year/capita) to traveler by mode	Partially	X	Requires TP+ run				
b	Infrastructure/Capital Facilities Costs - relative road, water, sewer, storm drain, education facility, and emergency service facilities costs	INDEX & Post-Process		Requires TP+ run to define roadway improvements		*	*	*
c	Average cost of real estate development	Partially		Costs not developed at this point				
2	*Congestion Relief*						*	
a	Vehicle hours of delay (hours/year/capita)	COG Models	X	Requires TP+ run		2Ce, 2Ci, 2Cj	*	
b	Congestion (Lane Miles at LOS E/F) by Facility Type and Sub-Region in tabular format.	COG Models		Requires TP+ run		2Ce, 2Ci, 2Cj	*	
3	*Improved Air Quality*					*	*	*
a	Air pollution (Nox, HC, CO, & CO2) (lbs/year/capita of non-attainment pollutants) emitted from light vehicles	Partially		Preliminary from INDEX, final from COFCG TP+ post-process	3.3	Goal 6, Goal 9		1D3, 2C1, 2C2, 2G1
b	Air pollution (lbs/year/capita of non-attainment pollutants) emitted from heavy vehicles	Partially		Not available from INDEX, final from COFCG TP+ post-process	3.3	Goal 6, Goal 9		1D3, 2C1, 2C2, 2G1
c	NOX and ROG emissions per vehicle mile traveled	Partially		COFCG TP+ post-process	3.3	Goal 9		1C1, 1C4, 1D3, 1E1,
d	NOX and ROG emissions per trip	Partially		COFCG TP+ post-process	3.3	Goal 9		1C1, 1C4, 1D3, 1E1,
e	Non-attainment emissions from transit vehicles/systems	Partially		COFCG TP+ post-process				
4	*Travel Time & Length (Jobs Housing Balance)*					*	*	*
a	Vehicle miles traveled (miles/year/capita)	INDEX / COG Models	X	Preliminary Home and Non-Home based from INDEX, final from COFCG TP+	3.3	Goal 9		1C4, 1D3, 1E1, 2C2, 2G1
b	Vehicle hours traveled (hours/year/capita)	INDEX / COG Models	X	Preliminary Home and Non-Home based from INDEX, final from COFCG TP+		2Ce, 2Ci, 2Cj	*	*
c	Daily and Peak Hour Vehicle Trip Time (Minutes) by Trip Purpose	COG Models, INDEX, 4D		Requires TP+ run	3.3	Goal 9		1C1, 1C4, 1D3, 1E1,
d	Job proximity to services (1/4 mile walking distance, average for study region displayed graphically and in tabular format - how many jobs are within 1/4 mile of services).	INDEX		Requires re-writing INDEX indicator - adjacency to transit will be calculated	3.2	Elm	LU F8 PF 1.2	

Smart Growth Indicators (Cont.)

								*	*	*
5		**Land and Water Consumption**								
	a	Land area taken up by new growth (total acres and acres per 1000 population)	What if?		Will be measured by What if?		3.2, 4.2	Goal 9, C2e, 2Cj, Elj, Elm *	LU F8 LUF10 LUF20	1D3, 2G1
	b	Percentage of growth that is infill	What if? / INDEX		Yet to define geography of what would be considered "infill"		3.2, 4.2	Goal 9, C2e, 2Cj, Elj, Elm *	LU F8 LUF10 LUF20	1D3, 2G1
	b2	Development Footprint (total gross acres per 1000 residents) combined measurement of infill and density of population and employment	INDEX		Will be measured by INDEX		2.3, 3.2, 4.2	Goal 5, Goal 9 Goal 9, C2e, 2Cj, Elj, Elm *	LU F3 LU F4 LU F8 LUF10 LUF20	1C2,1D3, 2G1
	c	Population density	What if? / INDEX		Will be measured by INDEX		2.3	Goal 5, Goal 9 *	LU F3 LU F4	1C2
	c2	Residential Footprint (total residential acres per 1000 residents)	INDEX		Will be measured by INDEX		2.3	Goal 5, Goal 9 *	LU F3 LU F4	1C2
	d	Employment density	What if? / INDEX		Will be measured by INDEX		2.3	Goal 5, Goal 9 *	LU F3 LU F4	1C2
	e	Acres of agriculture remaining (orchards, crops, and grazing land)	What if?		Will be measured by What if?		3.2, 4.2	Goal 9, C2e, 2Cj, Elj, Elm *	LU F8 LUF10 LUF20	1D3, 2G1
	g	Acres of public parks per capita	INDEX		Current land use data does not provide adequate mapping of parks locations		3.2, 4.2	Goal 9, C2e, 2Cj, Elj, Elm *	LU F8 LUF10 LUF20	1D3, 2G1
	h	Use Mix (mix of developed land uses among user defined grid)	INDEX		Will be measured by INDEX					
6		**Travel Mode Shift/Viability of Increased Transit Usage**						*	*	
	a	Transit Adjacency to Housing substituted for earlier requested measure (% of residences within 1/4 mile of transit corridor) [Population density in transit oriented area (w/in 1/2 mile of BRT or rail and w/in 1/4 mile of bus corridor)]	INDEX	X	Will be measured by INDEX		5.4, 5.6	A1h *	LU F3	1B2, 1C1, 1C2, 1D3, 1E1, 1F1
	b	Transit Adjacency to Employment substituted for earlier requested measure (% of employees within 1/4 mile of transit corridor) [Employment density in transit oriented areas (w/in 1/2 mile of	INDEX	X	Will be measured by INDEX		5.4, 5.6	A1h *	LU F3	1B2, 1C1, 1C2, 1D3, 1E1, 1F1
	c	Mode split proxy (change in daily and peak hour vehicle trips by purpose)	INDEX / COG Models	X	INDEX, final from COFCG TP+, possibly including Modes Split model		3.1	Goal 6 *	TR B3	2C1

Modeling Alternative Scenarios
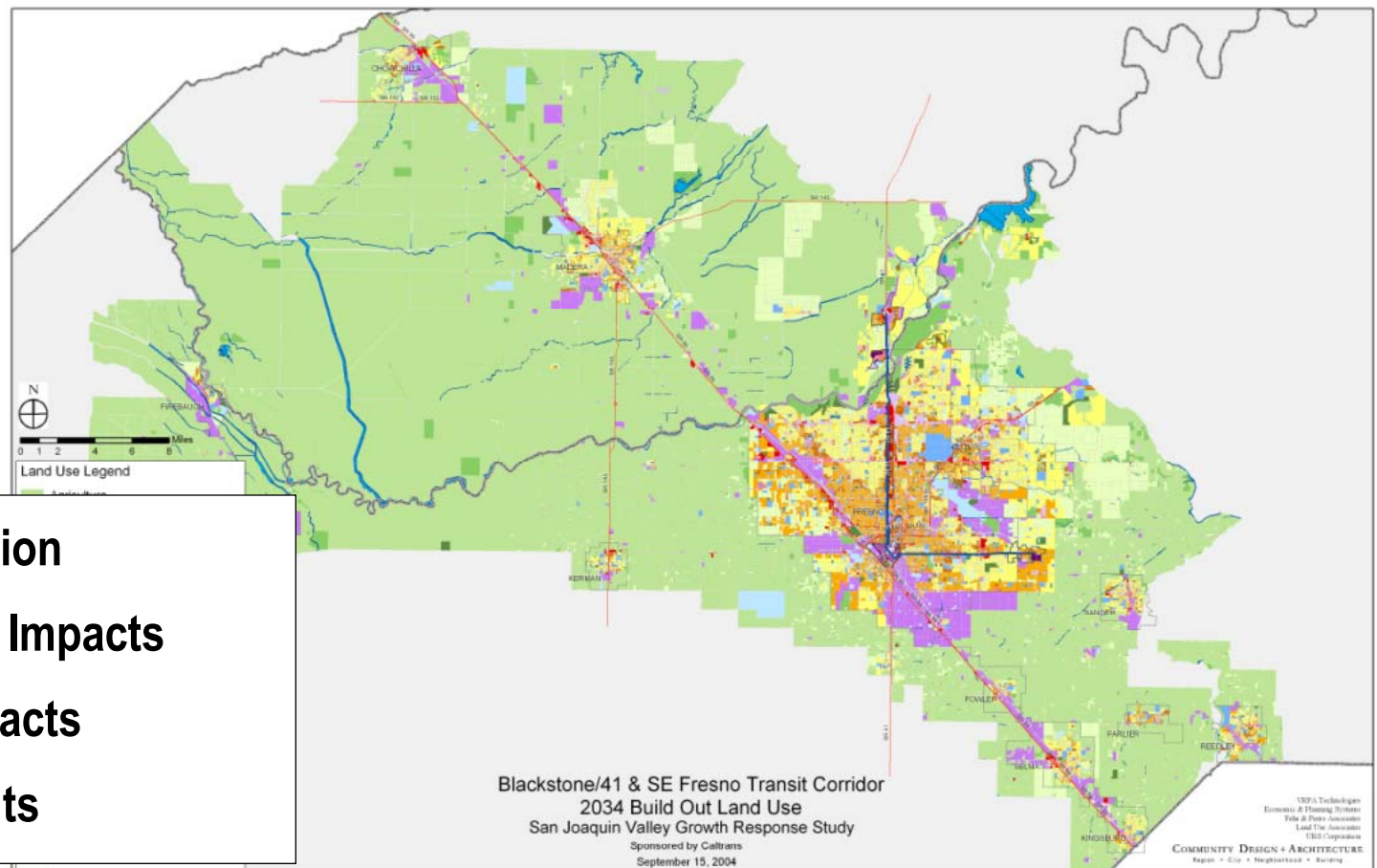
- **Growth Allocation**

- **Transportation Impacts**

- **Air Quality Impacts**

- **Indicator Results**

Blackstone/41 & SE Fresno Transit Corridor
2034 Build Out Land Use
San Joaquin Valley Growth Response Study
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"What if?" Land Allocation Results

- **Initial Run Scenario vs. Existing 2003**

Fresno Co.	Households	% Change	Jobs	% Change
Existing 2003	247,800		317,400	
Initial Run	450,300	82%	678,400	114%

Madera Co.	Households	% Change	Jobs	% Change
Existing 2003	27,100		30,700	
Initial Run	83,800	209%	50,600	65%
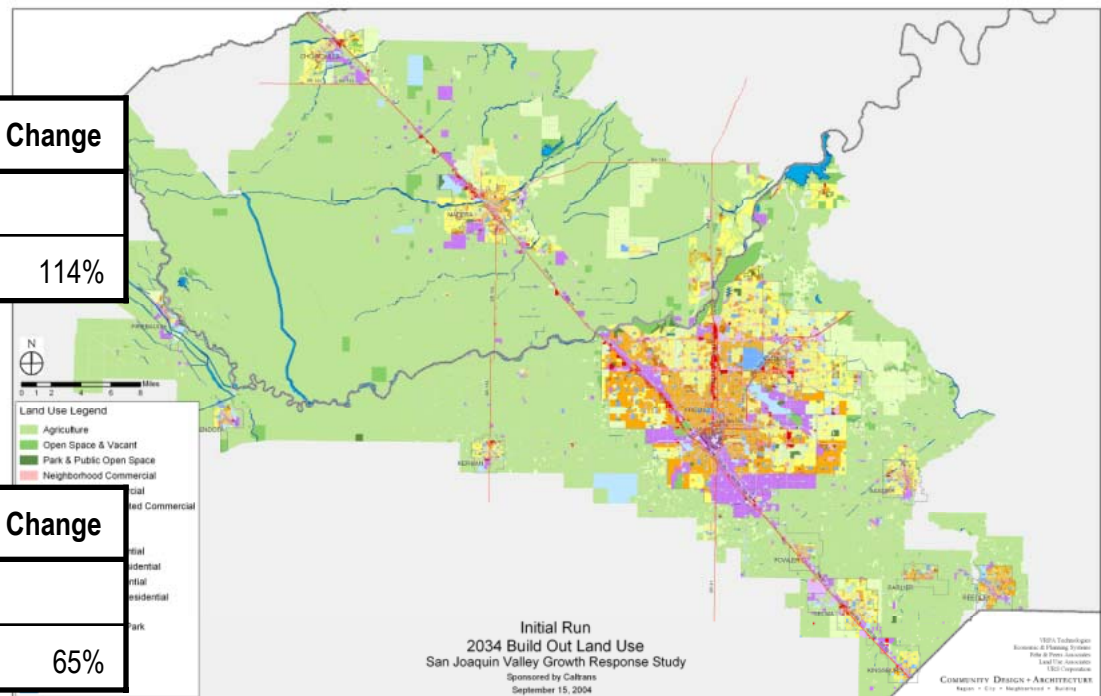
Land Use - 2034

"What if?" Land Allocation Results

■ **Blackstone/41-Downtown Fresno**

Scenario (Alt. 1) vs. Initial Run Scenario

Fresno Co.	Households	% Change	Jobs	% Change
Existing 2003	247,800		317,400	
Initial Run	450,300		678,400	
Blackstone/41	462,350	3%	639,100	-6%

Madera Co.	Households	% Change	Jobs	% Change
Existing 2003	27,100		30,700	
Initial Run	83,800		50,600	
Blackstone/41	79,400	-5%	105,550	109%

Blackstone/41 & SE Fresno Transit Corridor
2034 Build Out Land Use
San Joaquin Valley Growth Response Study
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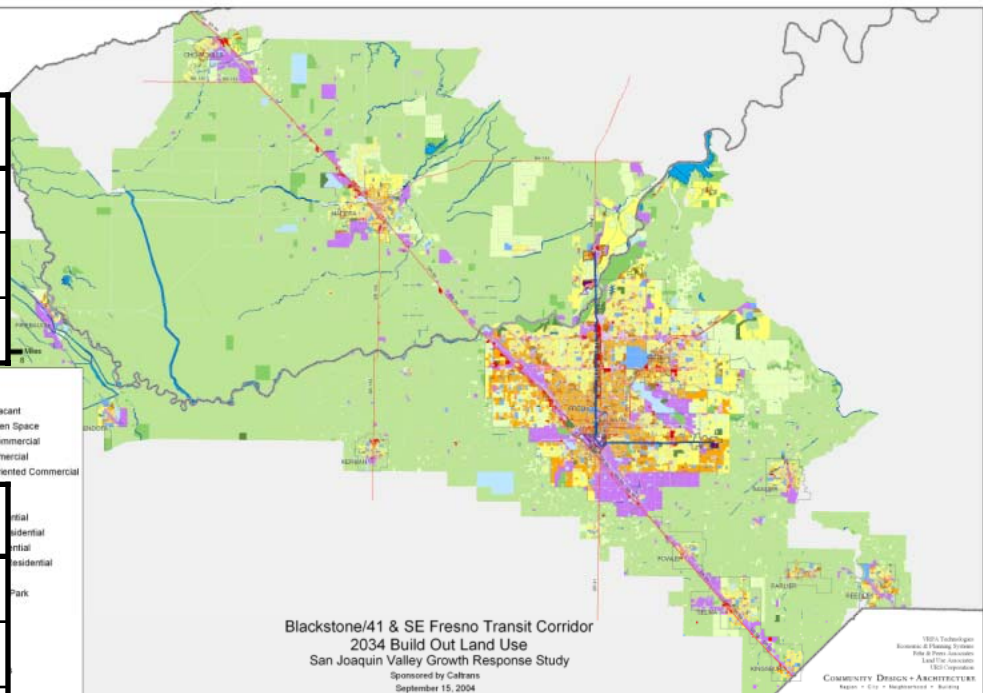
Land Use - 2034

"What if?" Land Allocation Results

■ **High Capacity Transit Network Scenario (Alt. 2) vs. Initial Run Scenario**

Fresno Co.	Households	% Change	Jobs	% Change
Existing 2003	247,800		317,400	
Initial Run	450,300		678,400	
Blackstone/41	462,350	3%	639,100	-6%
HCT Network	440,750	-2%	622,600	-8%

Madera Co.	Households	% Change	Jobs	% Change
Existing 2003	27,100		30,700	
Initial Run	83,800		50,600	
Blackstone/41	79,400	-5%	105,550	109%
HCT Network	91,650	9%	117,120	131%
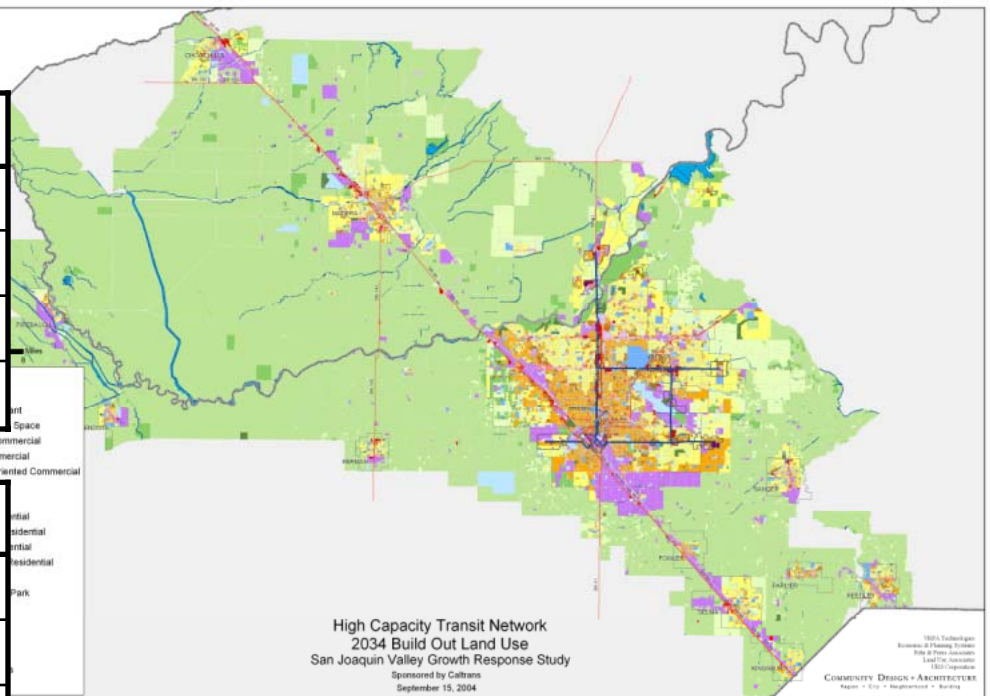
High Capacity Transit Network
2034 Build Out Land Use
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004

Land Use - 2034

Developable Land Remaining After New Growth

Initial Run Scenario vs. Existing 2003

Fresno Co.	"Developable" Land Area	% Change
Existing	70,200	
Initial Run	7,060	**-90%**

Madera Co.	"Developable" Land Area	% Change
Existing	32,200	
Initial Run	4,100	**-87%**
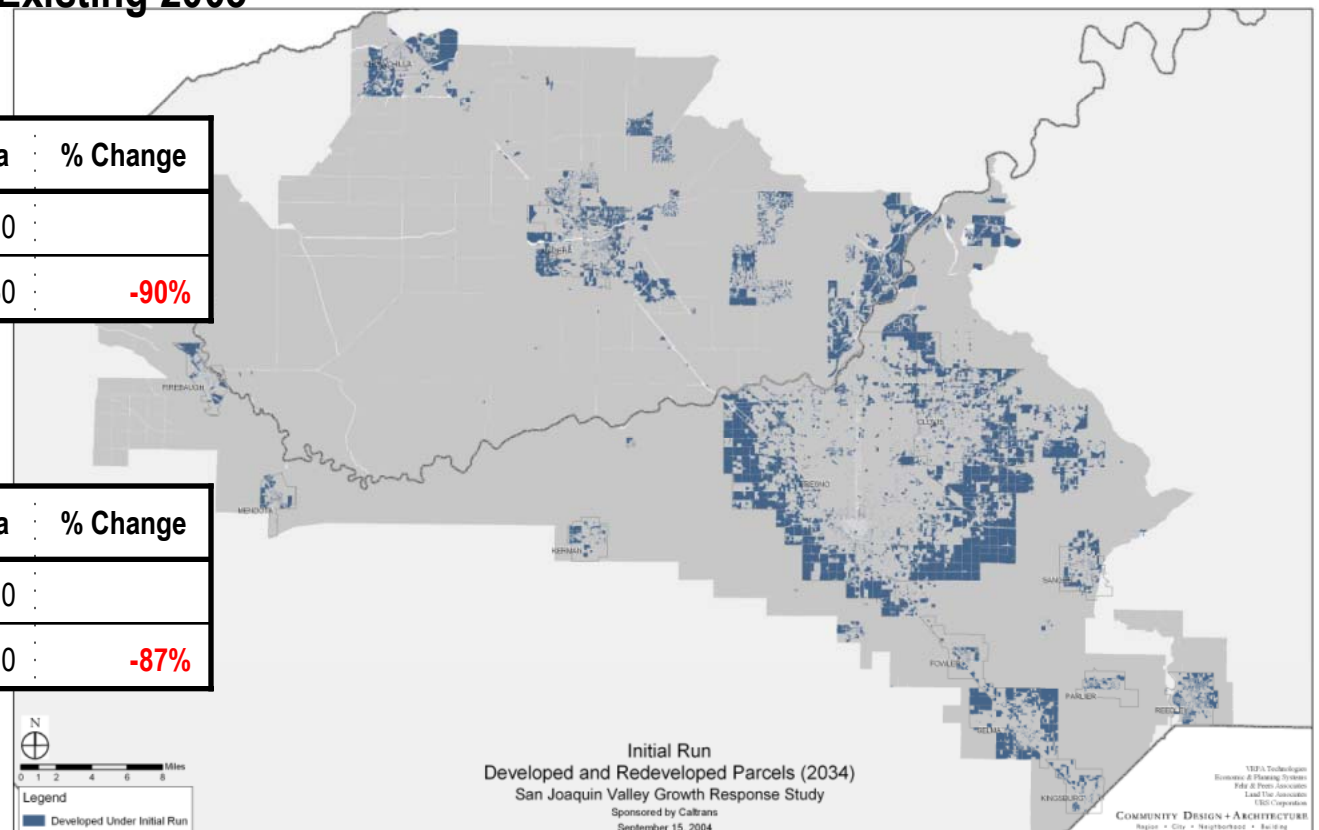
Initial Run
Developed and Redeveloped Parcels (2034)
San Joaquin Valley Growth Response Study
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Legend
Developed Under Initial Run

Note: "Developable" Land is vacant, rural residential, agriculture, and open space with urban General Plan Designations.

Developable Land Remaining After New Growth
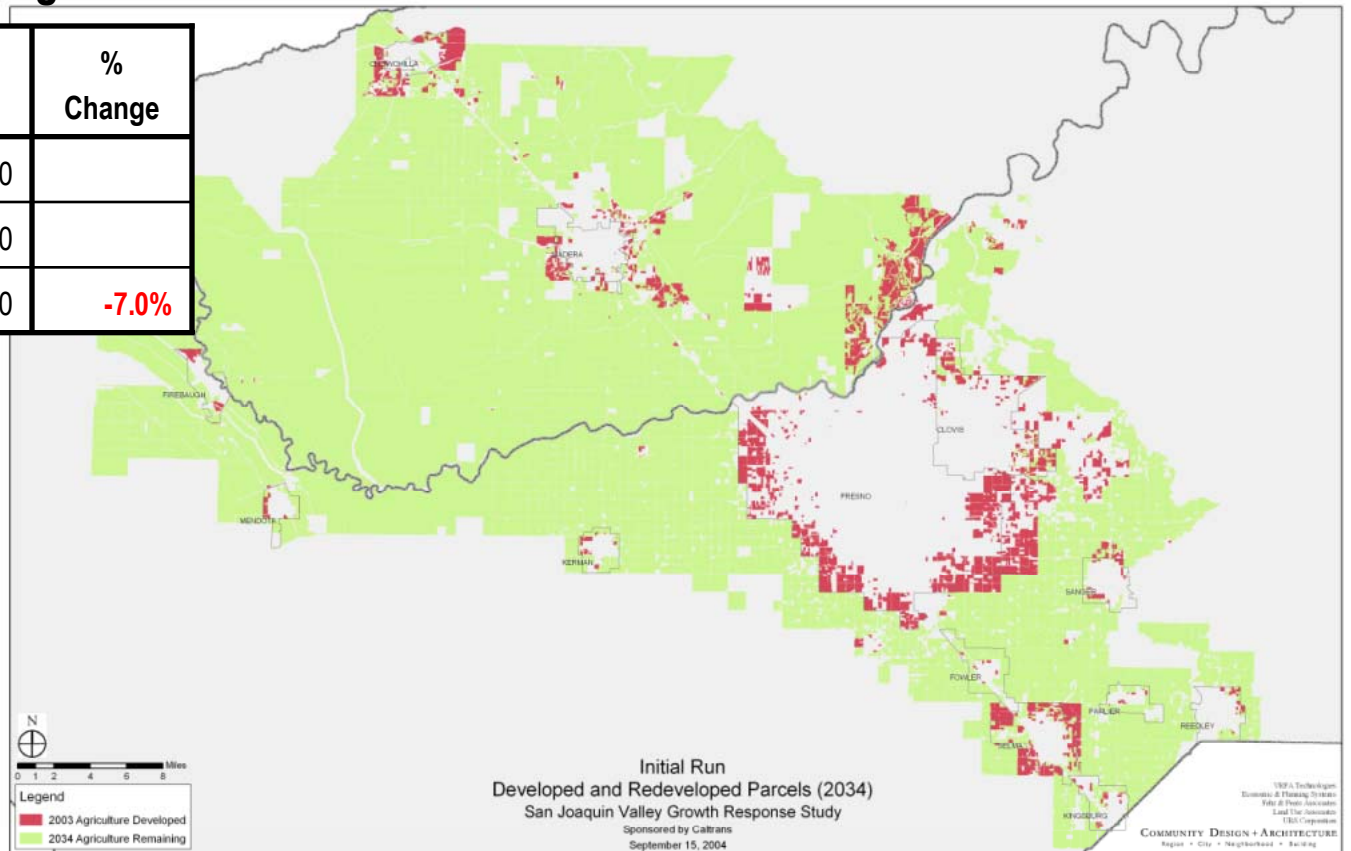
- **Blackstone/41-Downtown Fresno Scenario (Alt. 1) vs. Initial Run Scenario**

Fresno Co.	"Developable" Land Area	% Change
Existing	70,200	
Initial Run	7,060	
Blackstone/41	14,000	**98%**

Madera Co.	"Developable" Land Area	% Change
Existing	32,200	
Initial Run	4,100	
Blackstone/41	11,300	**176%**

Legend
- Developed Under Initial Run
- Developed Under Initial Run and Alt. 1
- Developed Under Alt. 1

Blackstone/41 & SE Fresno Transit Corridor (Alt. 1) vs. Initial Run
Developed and Redeveloped Parcels (2034)
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004
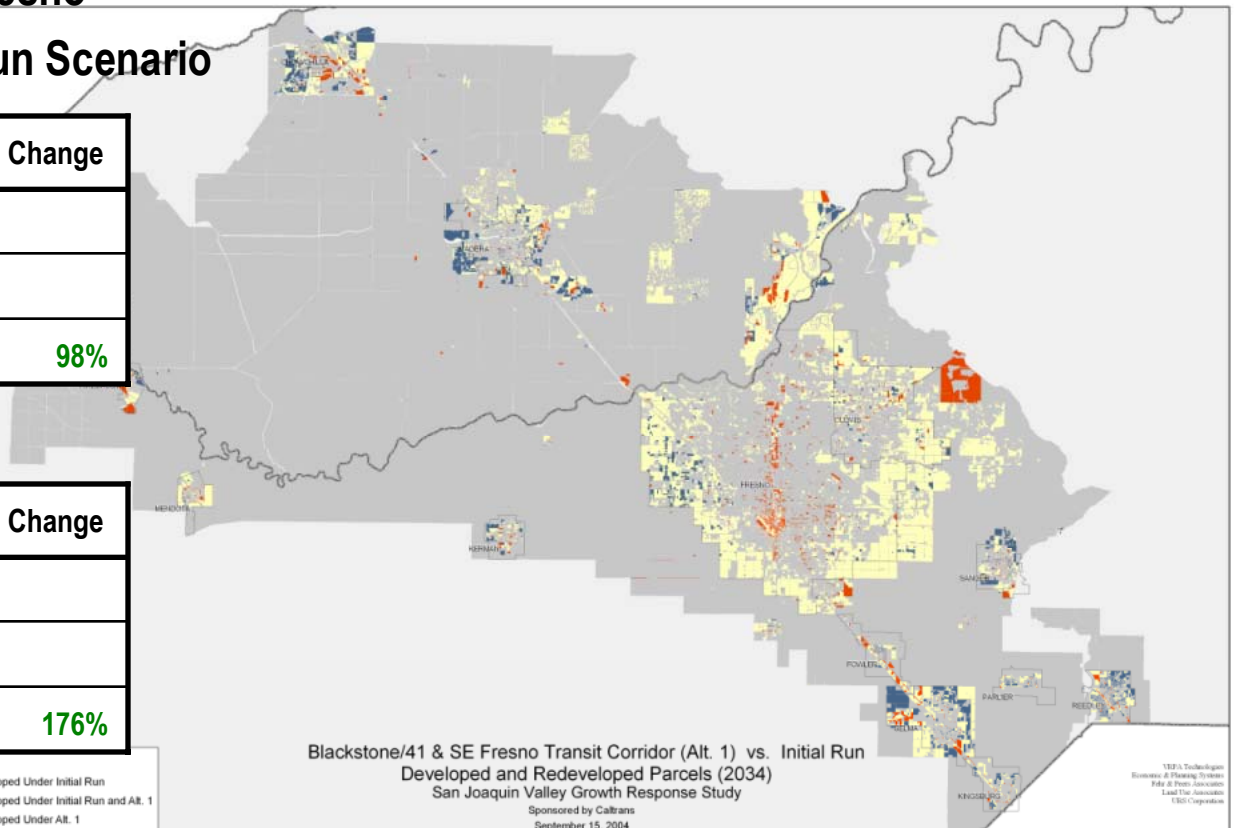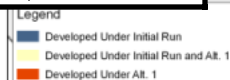
Note: "Developable" Land is vacant, rural residential, agriculture, and open space with urban General Plan Designations.

Developable Land Remaining After New Growth

- **High Capacity Transit Network Scenario (Alt. 2) vs. Initial Run**

Fresno Co.	"Developable" Land Area	% Change
Existing	70,200	
Initial Run	7,060	
Blackstone/41	14,000	98%
HCT Network	10,200	**44%**

Madera Co.	"Developable" Land Area	% Change
Existing	32,200	
Initial Run	4,100	
Blackstone/41	11,300	176%
HCT Network	5,660	**38%**
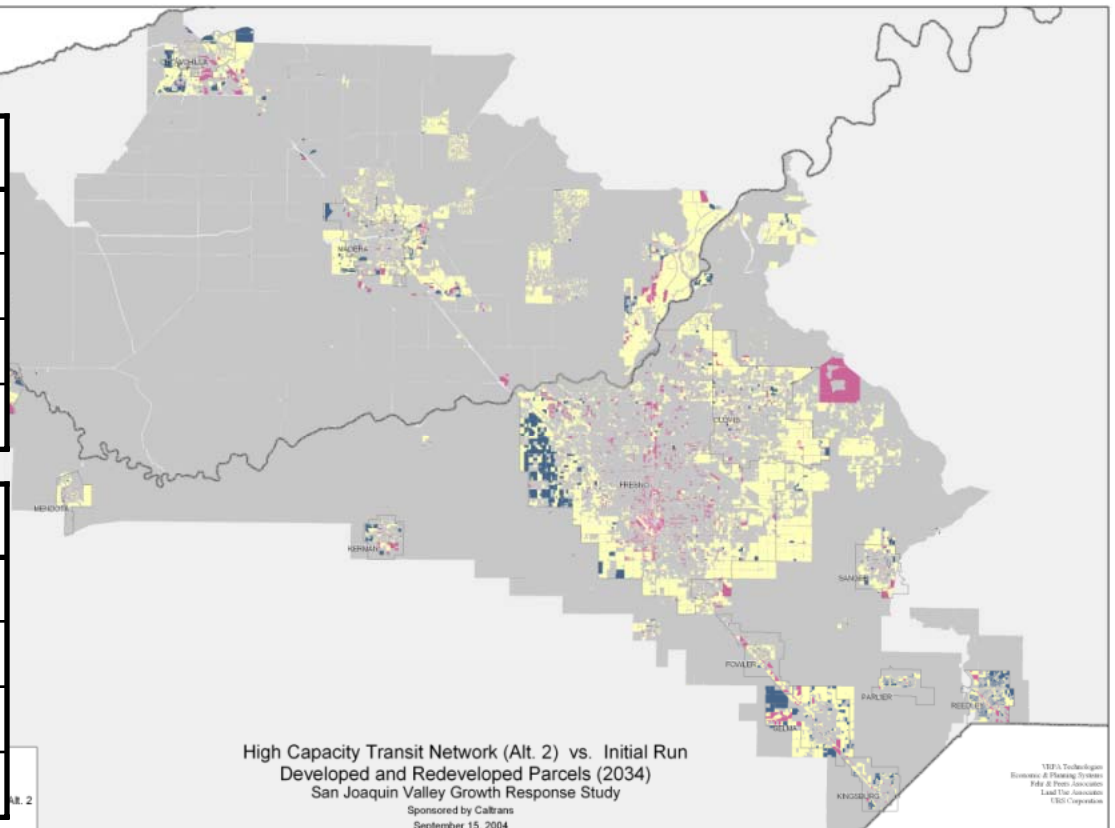
High Capacity Transit Network (Alt. 2) vs. Initial Run
Developed and Redeveloped Parcels (2034)
San Joaquin Valley Growth Response Study
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Note: "Developable" Land is vacant, rural residential, agriculture, and open space with urban General Plan Designations.

Acres of Agriculture Land Remaining

- **<u>All</u> Scenarios vs. Existing 2003**

	2003 Acres	2034 Acres	% Change
Fresno County	288.600	255,500	
Madera County	393,400	378,500	
Total Study Area	682,000	634,000	**-7.0%**

Initial Run
Developed and Redeveloped Parcels (2034)
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
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Legend
- 2003 Agriculture Developed
- 2034 Agriculture Remaining

Development Footprint

Development Footprint

Acres per developed land

2003 Existing
Development Footprint
San Joaquin Valley Growth Response Study
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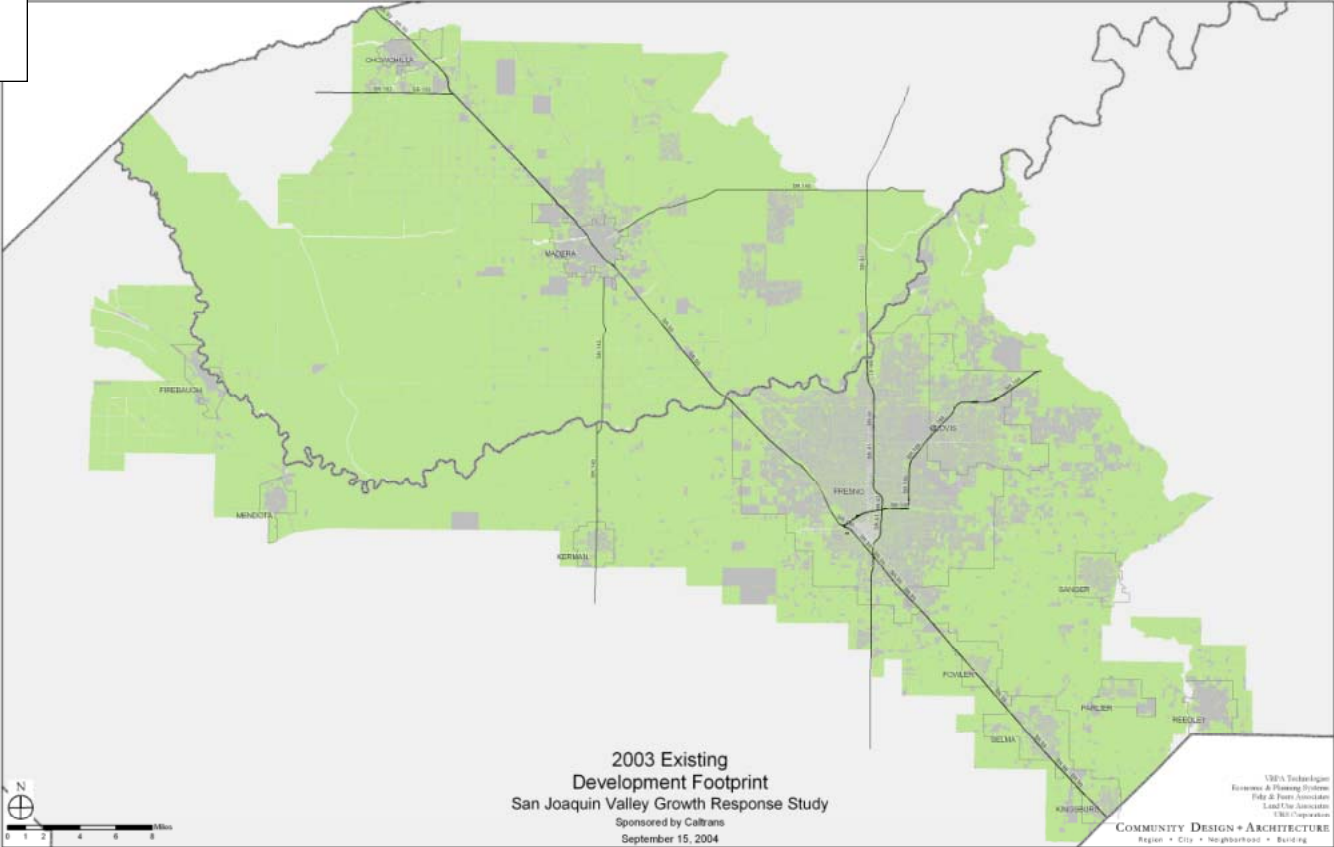
Development Footprint

- **Initial Run Scenario vs. Existing 2003**

2034 Initial Run
Development Footprint
San Joaquin Valley Growth Response Study
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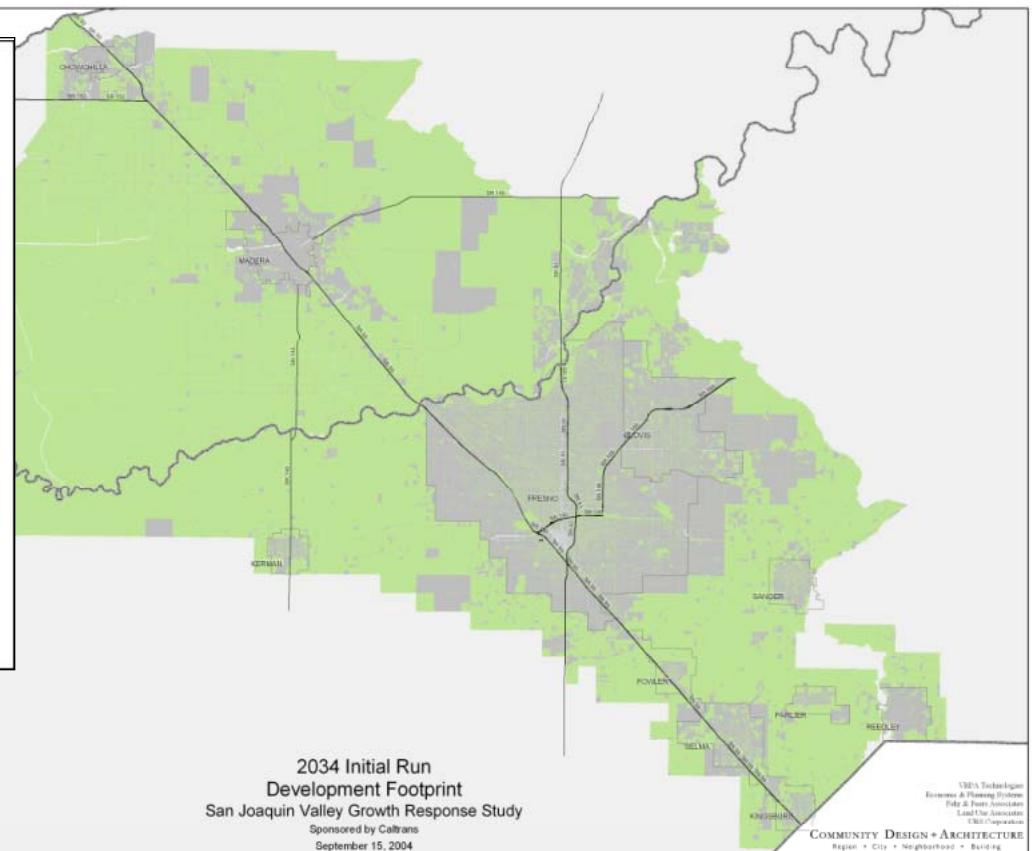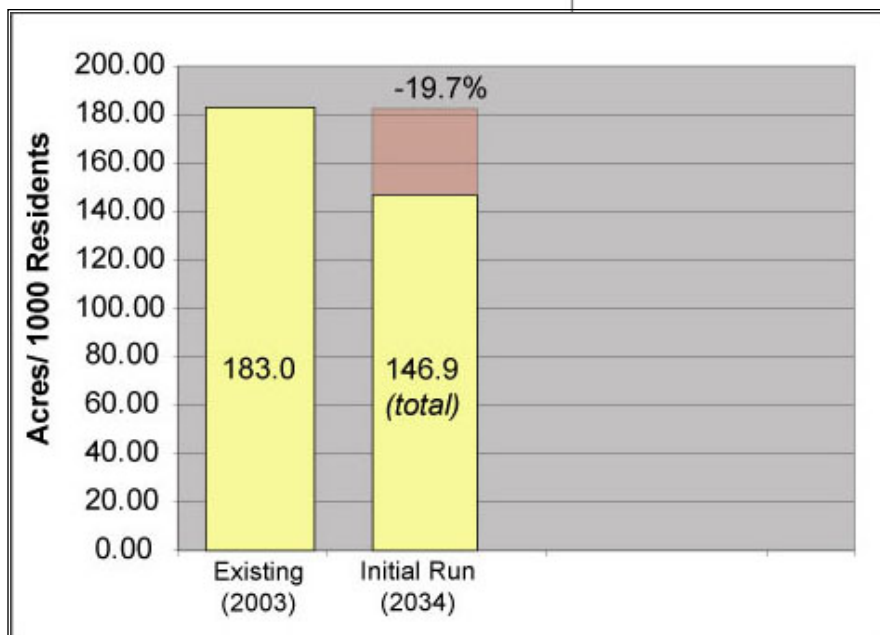
Development Footprint

- **Alternatives 1 and 2 vs. Initial Run**
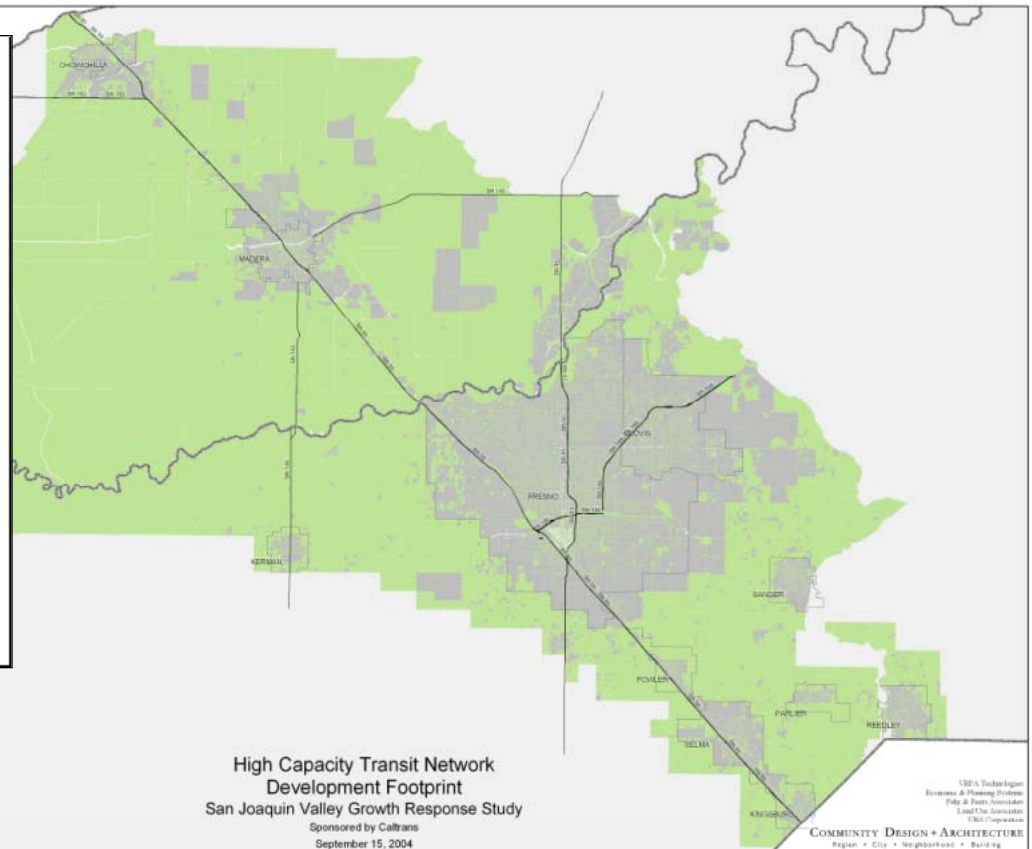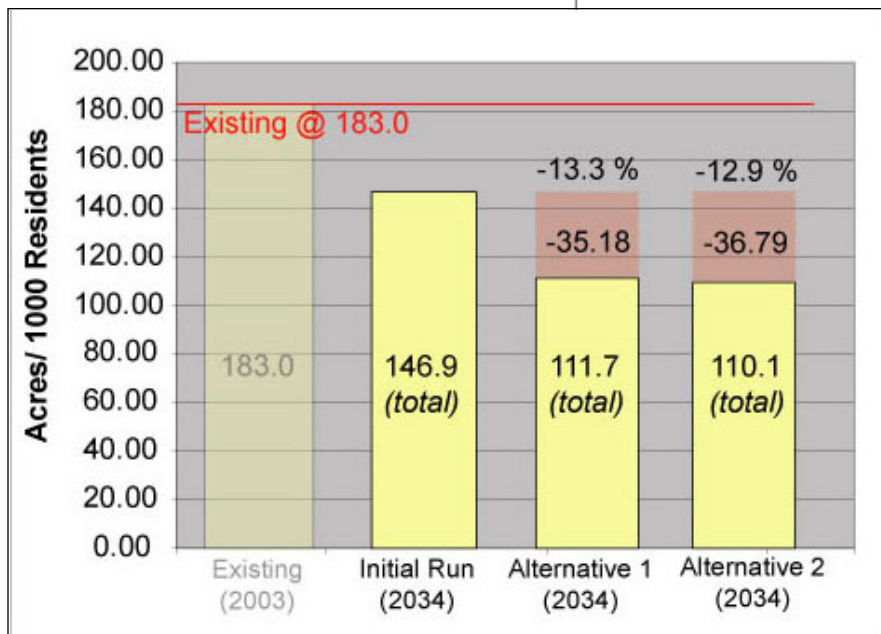
High Capacity Transit Network
Development Footprint
San Joaquin Valley Growth Response Study
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Population and Employment Density

- **Population and Employment Density**
  - Population Density - population per gross developed acre of residential development
  - Employment Density - employees per gross acre of employment use

2003 Existing
Population and Employment Density
San Joaquin Valley Growth Response Study
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Legend

Population Density
- 1.0 - 6.0 res/ac
- 6.1 - 15.0 res/ac
- 15.1 - 30.0 res/ac
- 30.1+ res/ac

Employment Density
- 0.137458 - 5.000000
- 5.000001 - 15.000000
- 15.000001 - 40.000000
- 40.000001 - 300.000000
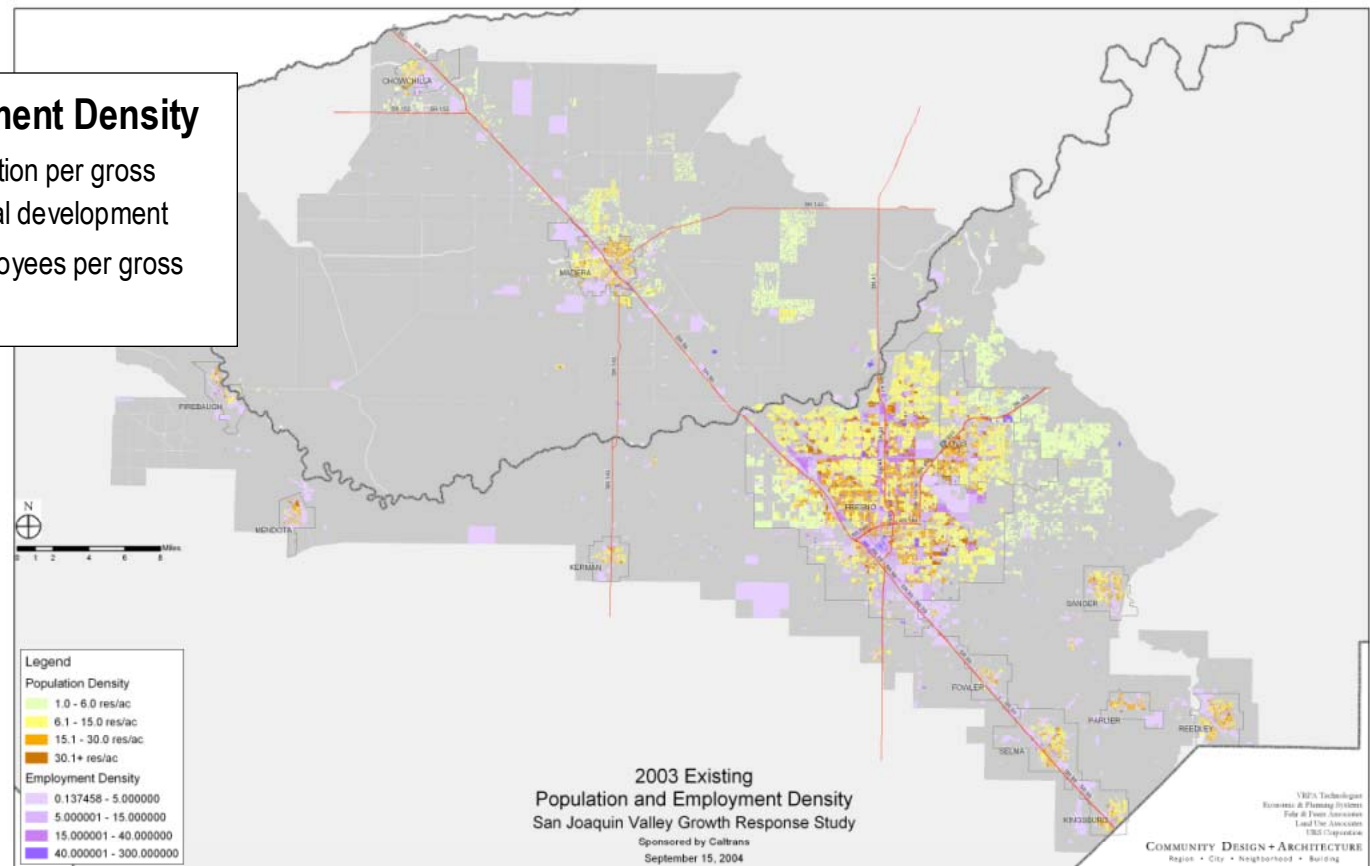
Population Density

■ **Initial Run vs. Existing 2003**

2034 Initial Run
Population and Employment Density
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004

Legend
Population Density
- 1.0 - 6.0 res/ac
- 6.1 - 15.0 res/ac
- 15.1 - 30.0 res/ac
- 30.1+ res/ac
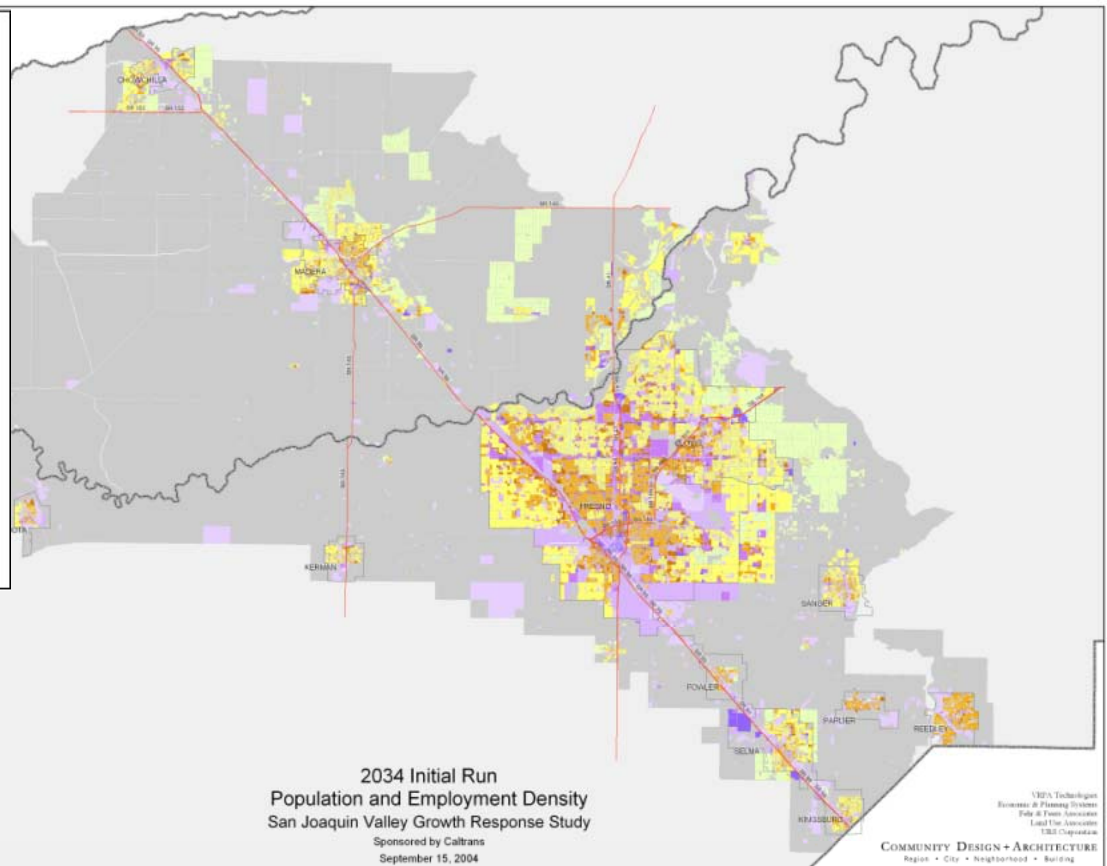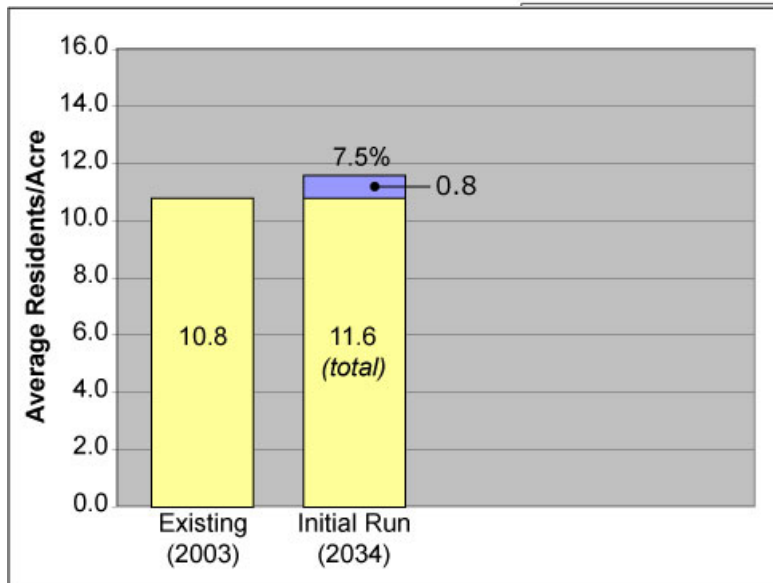
Employment Density
- 1.0 - 5.0 emp/ac
- 5.1 - 15.0 emp/ac
- 15.1 - 40.0 emp/ac
- 40.0 emp/ac

Population Density

■ **Alternatives 1 and 2 vs. Initial Run**

Blackstone/41 & SE Fresno Transit Corridor
Population and Employment Density
San Joaquin Valley Growth Response Study
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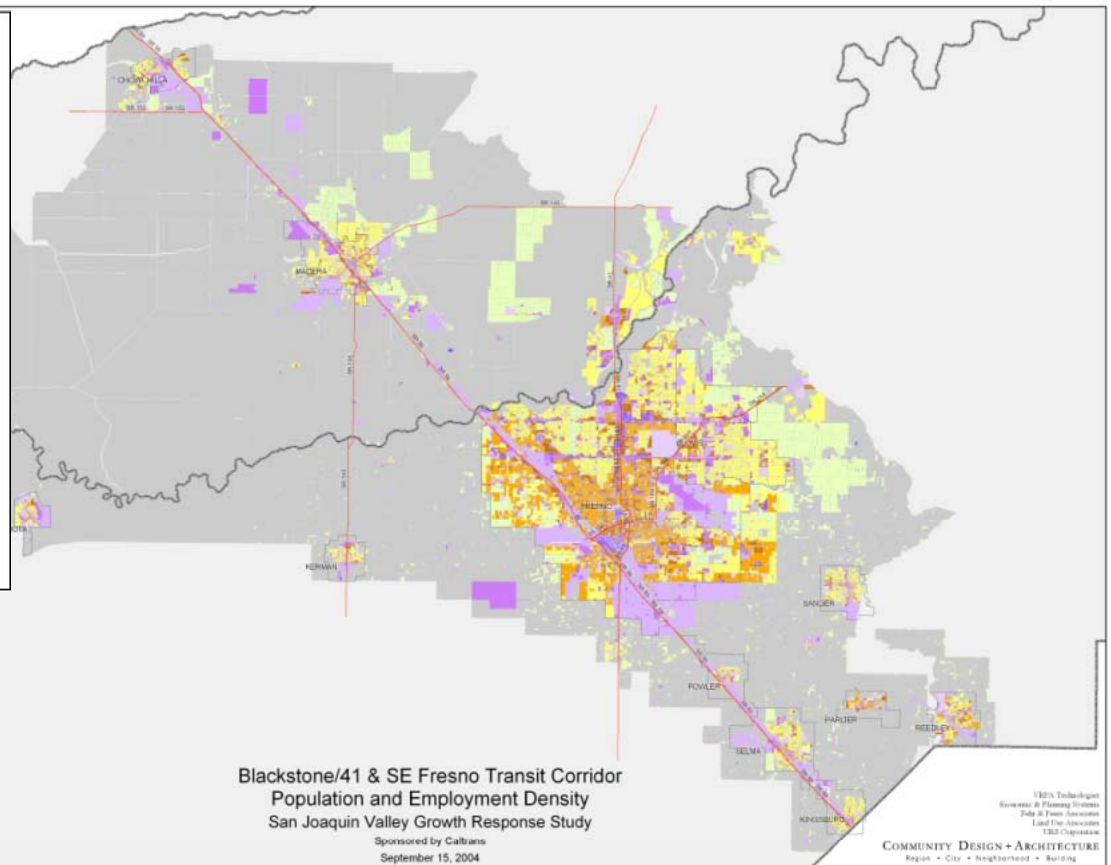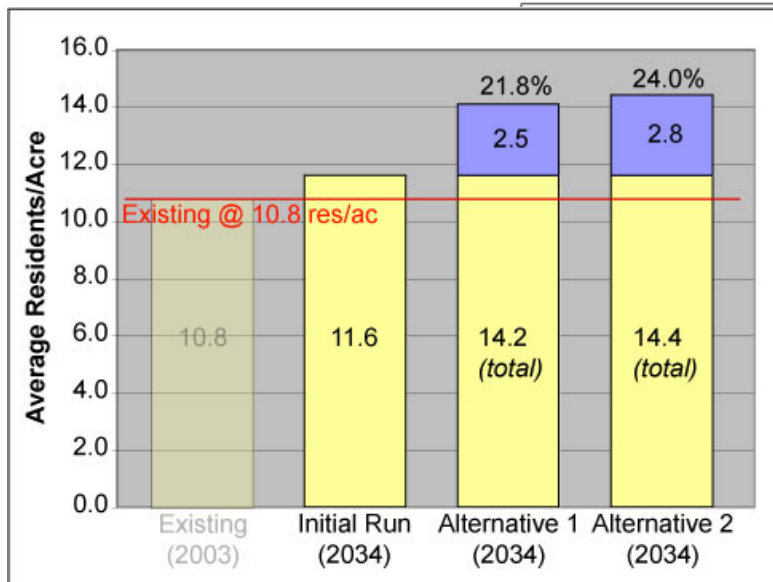
Employment Density

- **Initial Run vs. Existing 2003**

Chart: Employees/Acre

- Existing (2003): 11.10
- Initial Run (2034): 14.97 (total), 34.9 %

Legend

Population Density
- 1.0 - 6.0 res/ac
- 6.1 - 15.0 res/ac
- 15.1 - 30.0 res/ac
- 30.1+ res/ac

Employment Density
- 1.0 - 5.0 emp/ac
- 5.1 - 15.0 emp/ac
- 15.1 - 40.0 emp/ac
- 40.0 emp/ac

2034 Initial Run
Population and Employment Density
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004

COMMUNITY DESIGN + ARCHITECTURE
Region · City · Neighborhood · Building
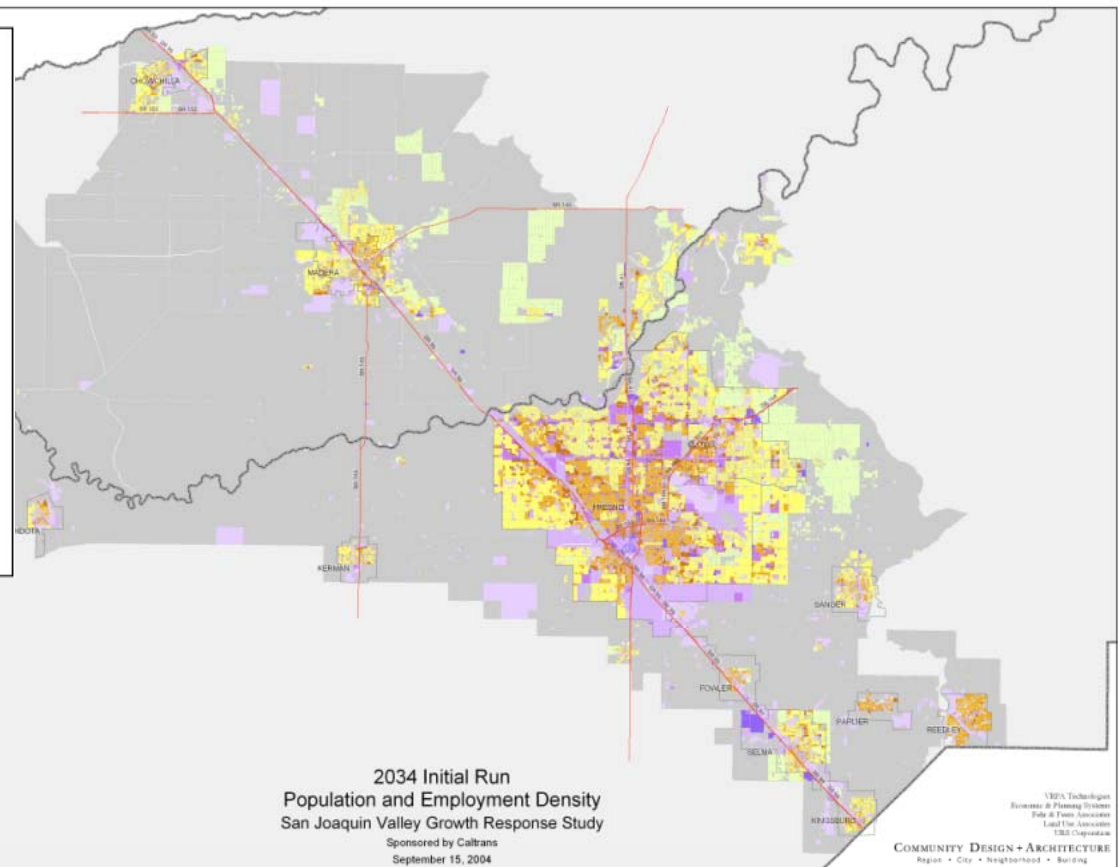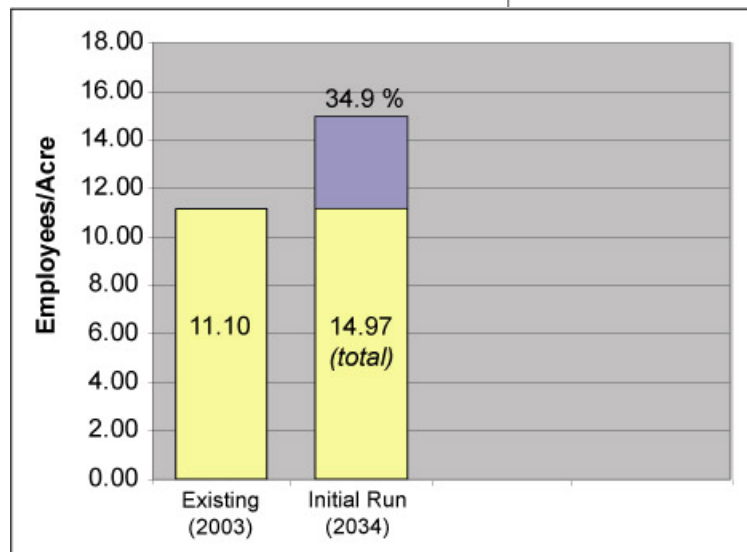
Employment Density

- **Alternatives 1 and 2 vs. Initial Run**
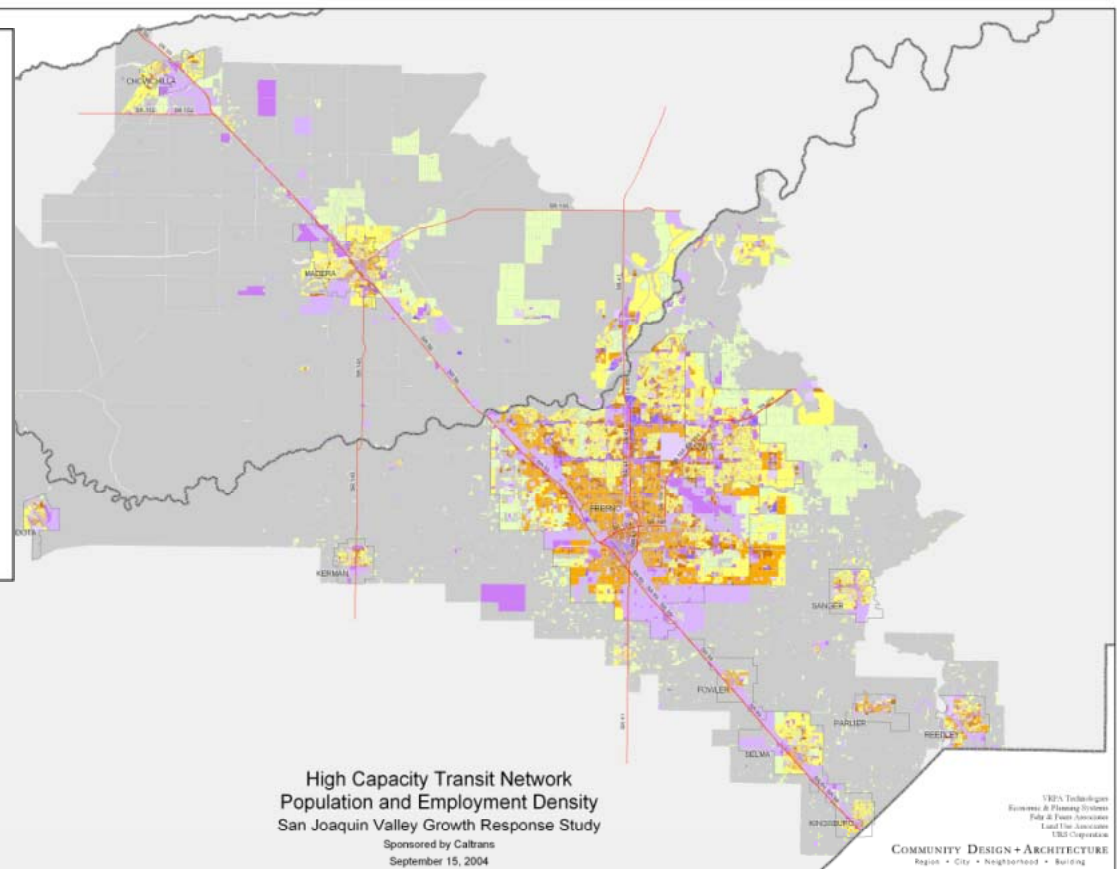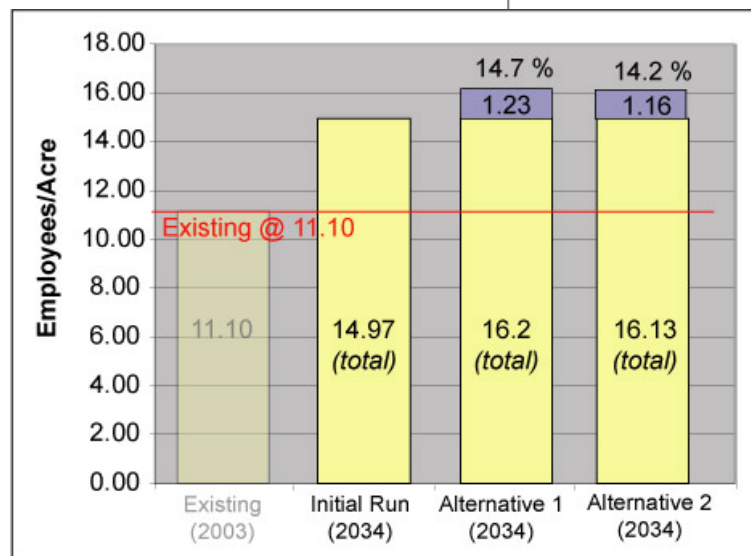
Use Mix

■ **Use Mix**

● Mix of land uses within a 1/4-mile grid

2003 Existing
Use Mix
San Joaquin Valley Growth Response Study
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Legend
- 0.00-10.00%
- 10.01-20.00%
- 20.01-30.00%
- 30.01-40.00%
- 40.01-50.00%
- 50.01-100.00%
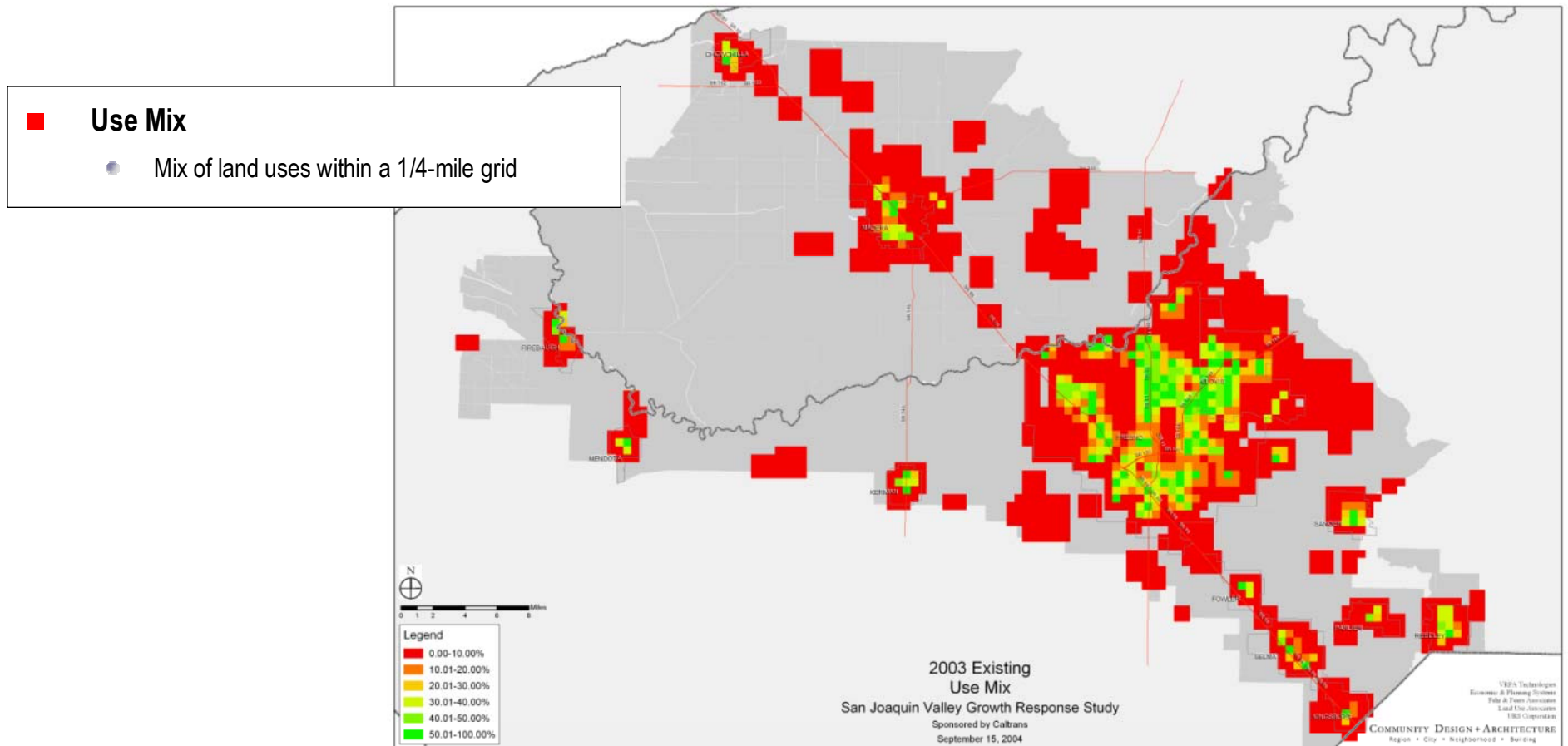
Use Mix

Initial Run vs. Existing 2003
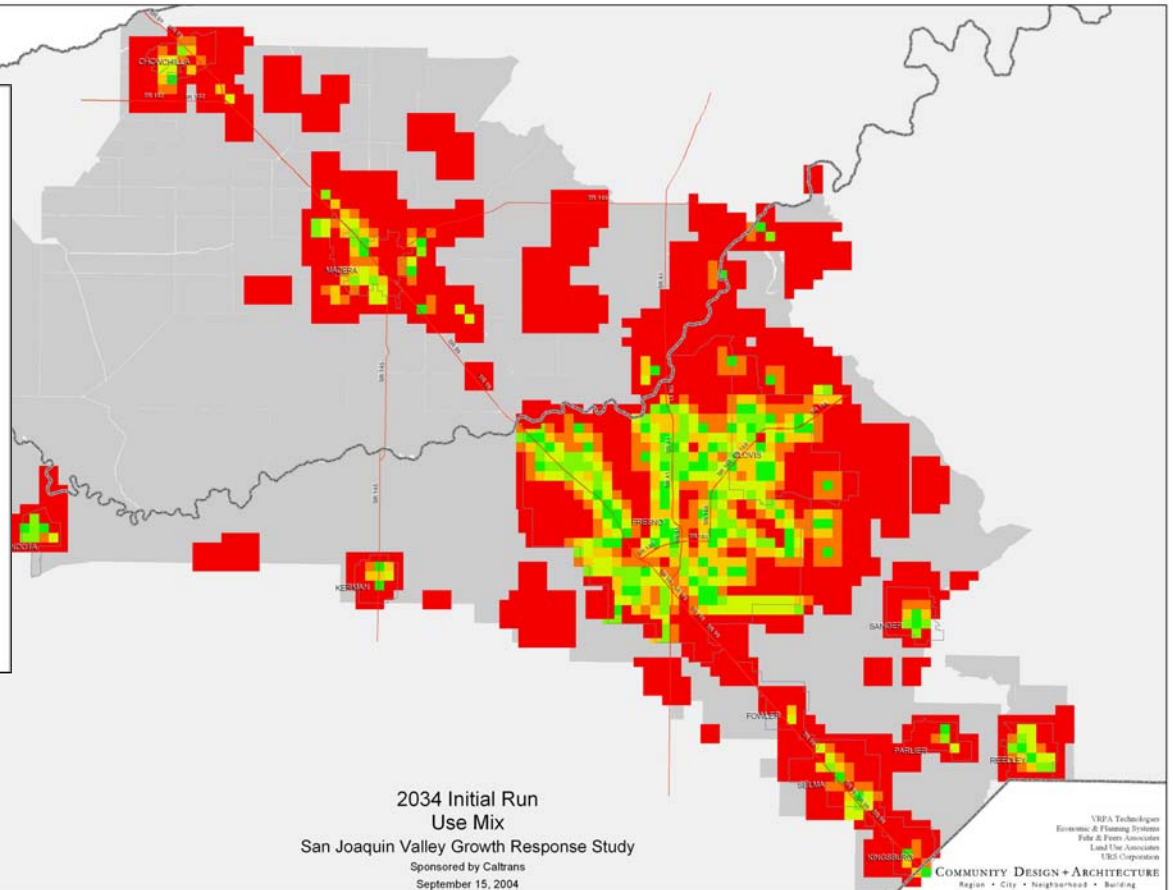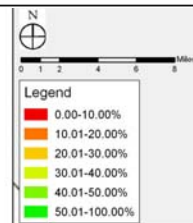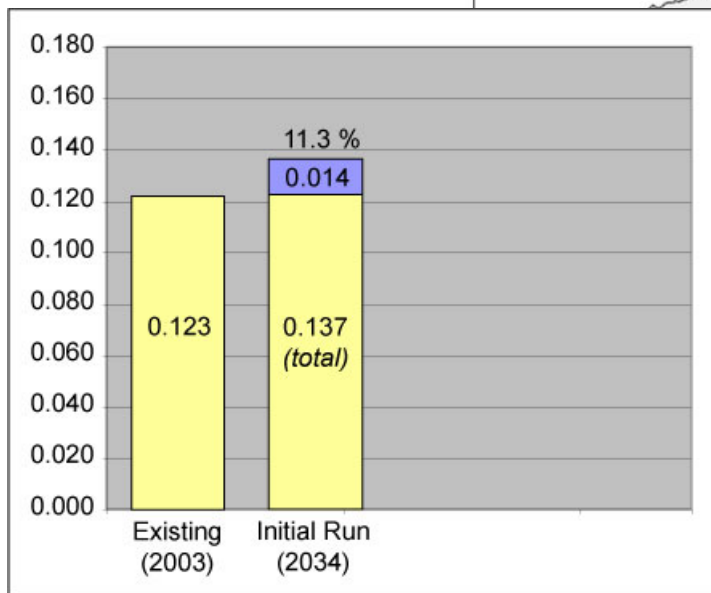
Chart:
- Existing (2003): 0.123
- Initial Run (2034): 0.137 (total), with 0.014 increment labeled 11.3 %

Map legend:
- 0.00-10.00%
- 10.01-20.00%
- 20.01-30.00%
- 30.01-40.00%
- 40.01-50.00%
- 50.01-100.00%

2034 Initial Run
Use Mix
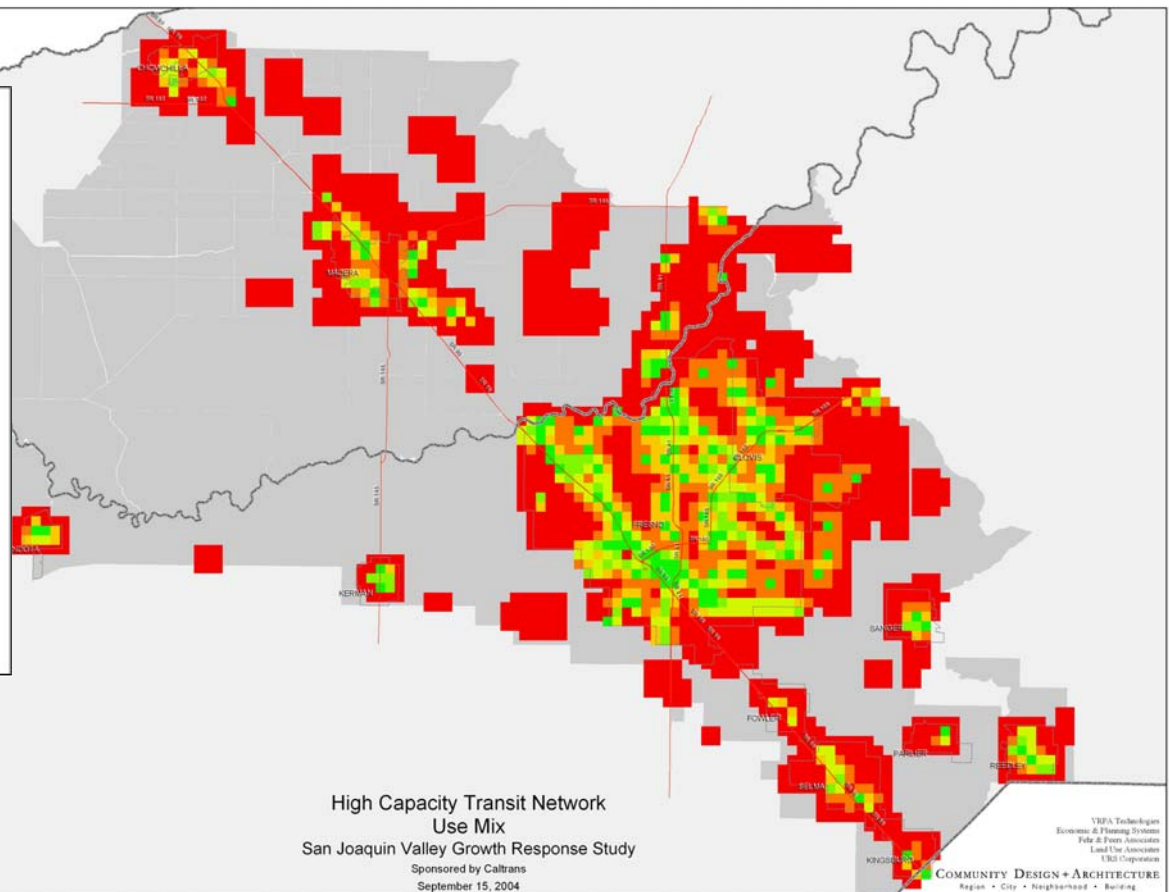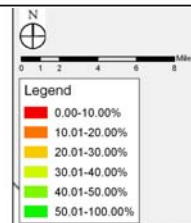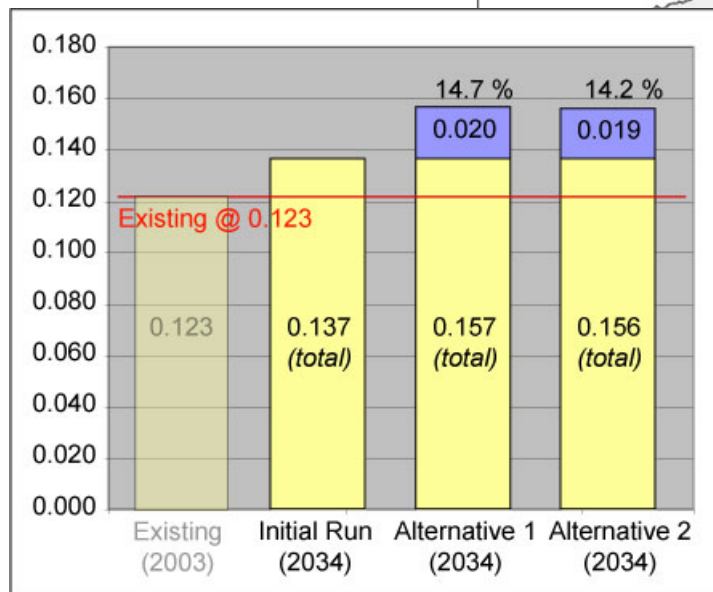San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004

San Joaquin Valley Growth Response Study, Phase III
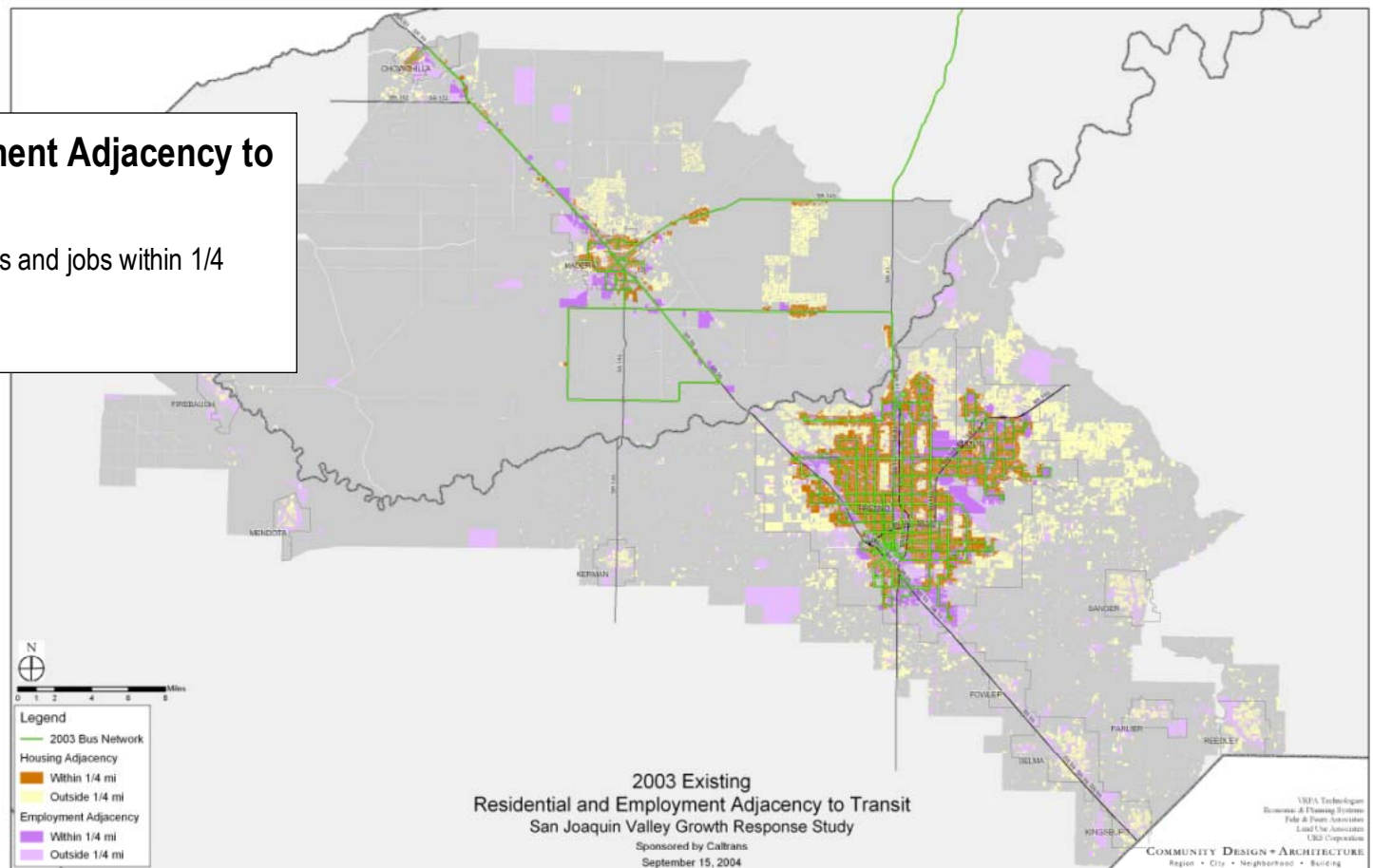
Use Mix

Alternatives 1 & 2 vs. Initial Run

San Joaquin Valley Growth Response Study, Phase III

Use Mix

Alternatives 1 & 2 vs. Initial Run

	Existing (2003)	Initial Run (2034)	Alternative 1 (2034)	Alternative 2 (2034)
	0.123	0.137 (total)	0.157 (total) / 0.020 / 14.7%	0.156 (total) / 0.019 / 14.2%

Existing @ 0.123

Legend
- 0.00-10.00%
- 10.01-20.00%
- 20.01-30.00%
- 30.01-40.00%
- 40.01-50.00%
- 50.01-100.00%

High Capacity Transit Network
Use Mix
San Joaquin Valley Growth Response Study
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COMMUNITY DESIGN + ARCHITECTURE
Region · City · Neighborhood · Building
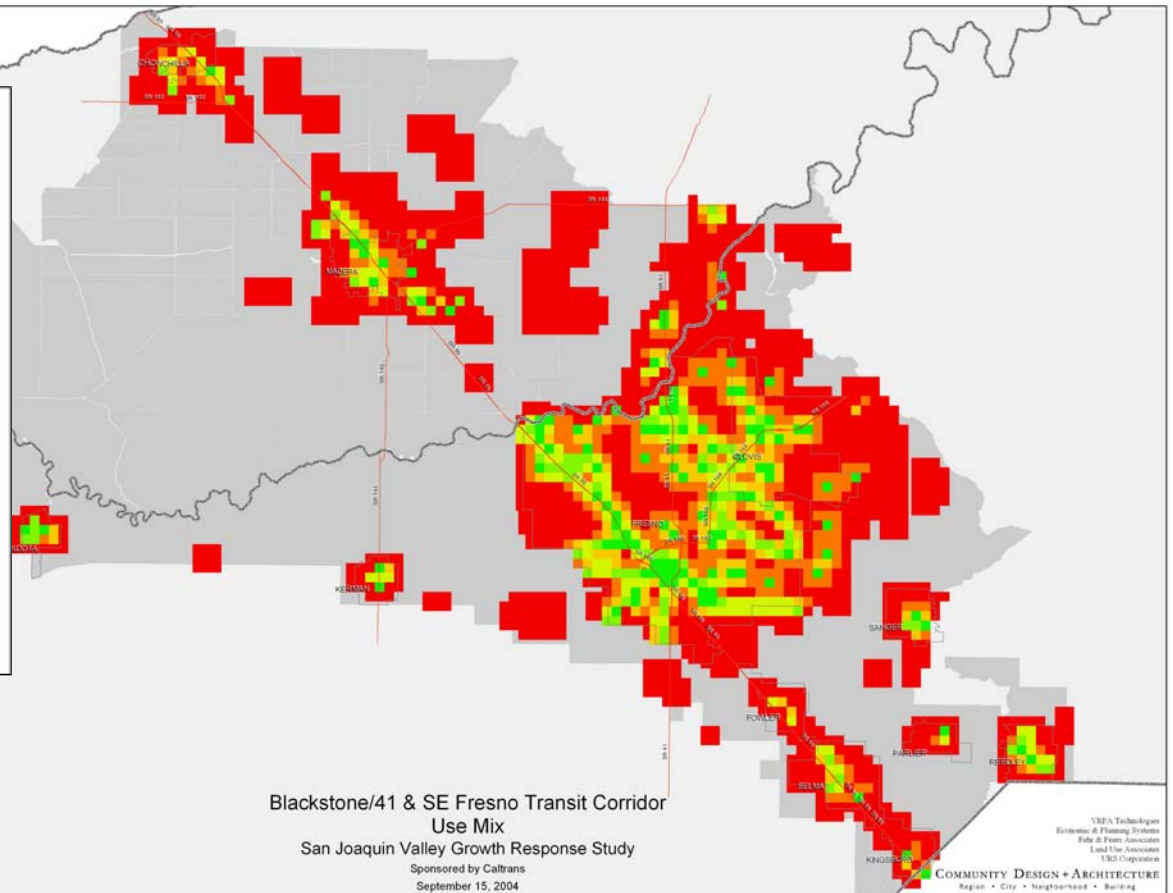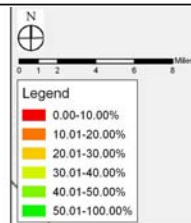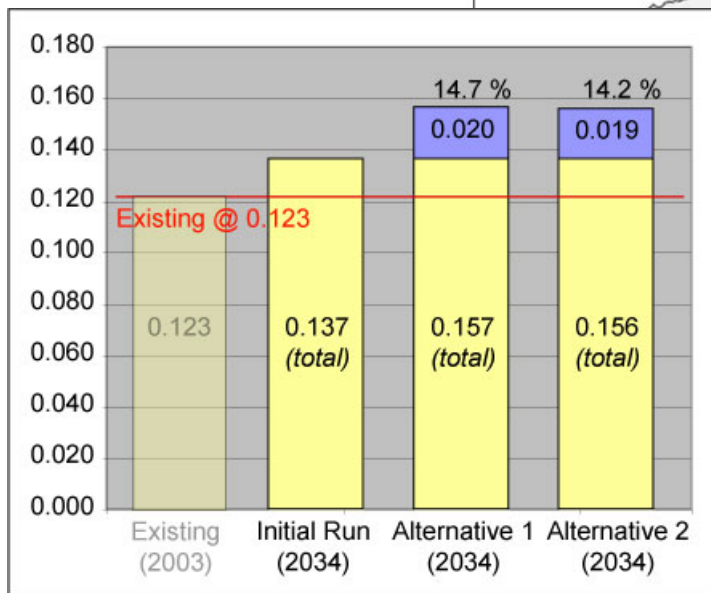
Housing & Employment Adjacency to Transit

- **Housing & Employment Adjacency to Transit**
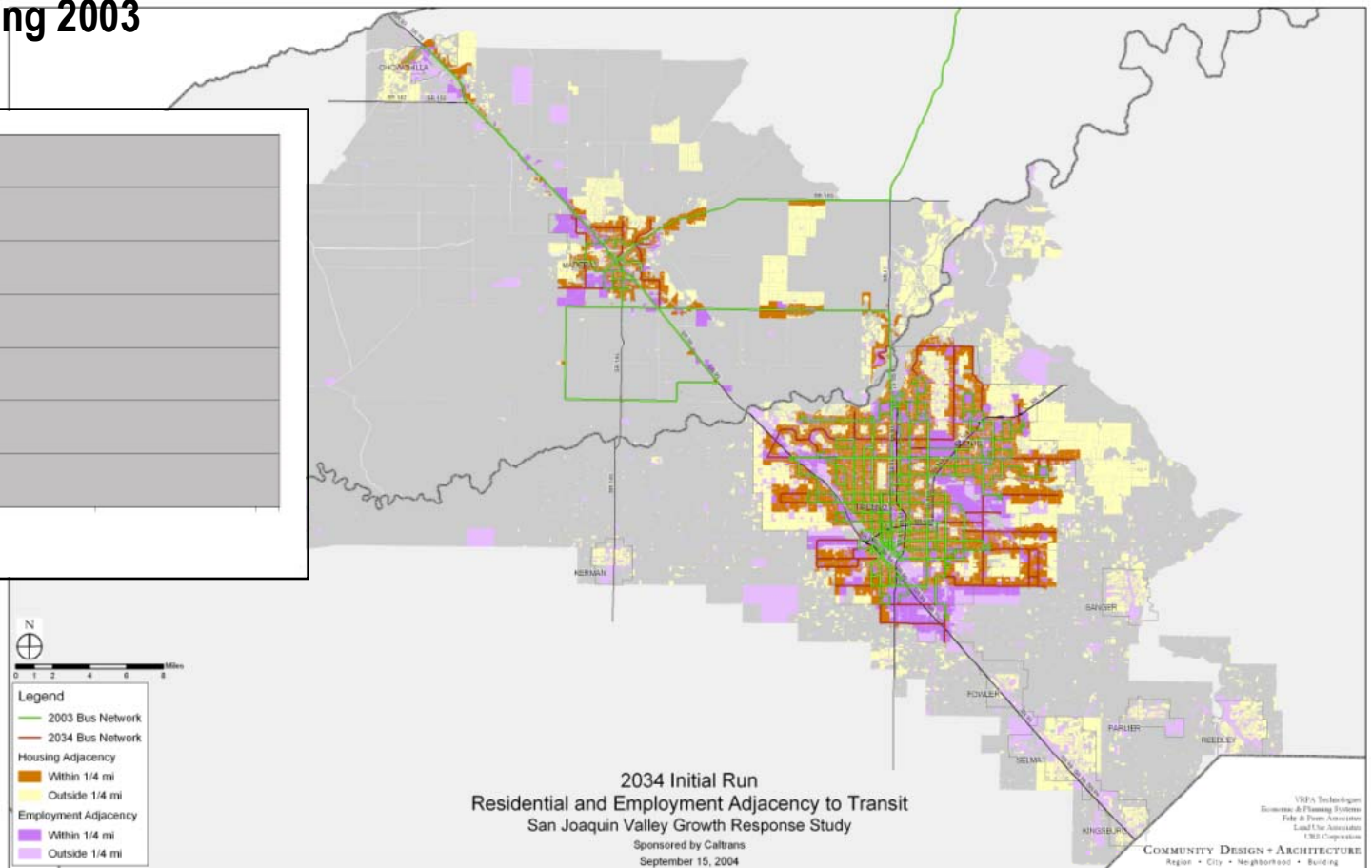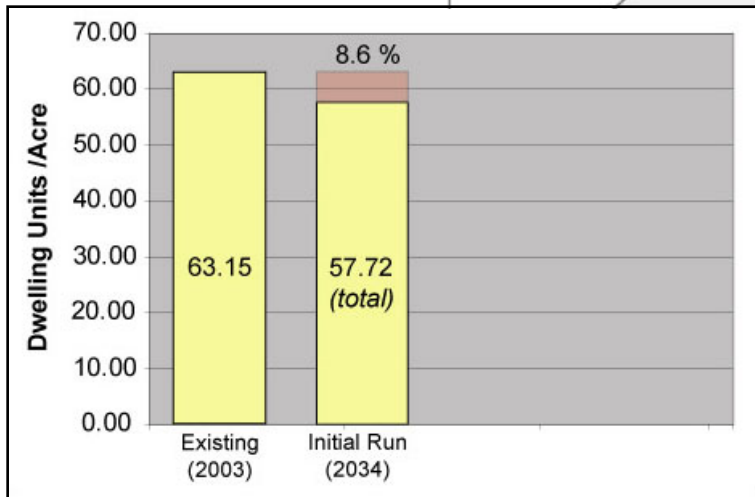 - Percent of households and jobs within 1/4 mile of a transit line

2003 Existing
Residential and Employment Adjacency to Transit
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004

Transit Adjacency to Housing

■ **Initial Run vs. Existing 2003**

2034 Initial Run
Residential and Employment Adjacency to Transit
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
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Transit Adjacency to Housing

Alternatives 1 and 2 vs. Initial Run

Blackstone/41 & SE Fresno Transit Corridor
Residential and Employment Adjacency to Transit
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004

Transit Adjacency to Employment

■ **Initial Run vs. Existing 2003**

Chart: Employees/Acre

- Existing (2003): 72.92
- Initial Run (2034): 55.09
- -24.5 %

Legend
- — 2003 Bus Network
- — 2034 Bus Network

Housing Adjacency
- Within 1/4 mi
- Outside 1/4 mi

Employment Adjacency
- Within 1/4 mi
- Outside 1/4 mi

2034 Initial Run
Residential and Employment Adjacency to Transit
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004
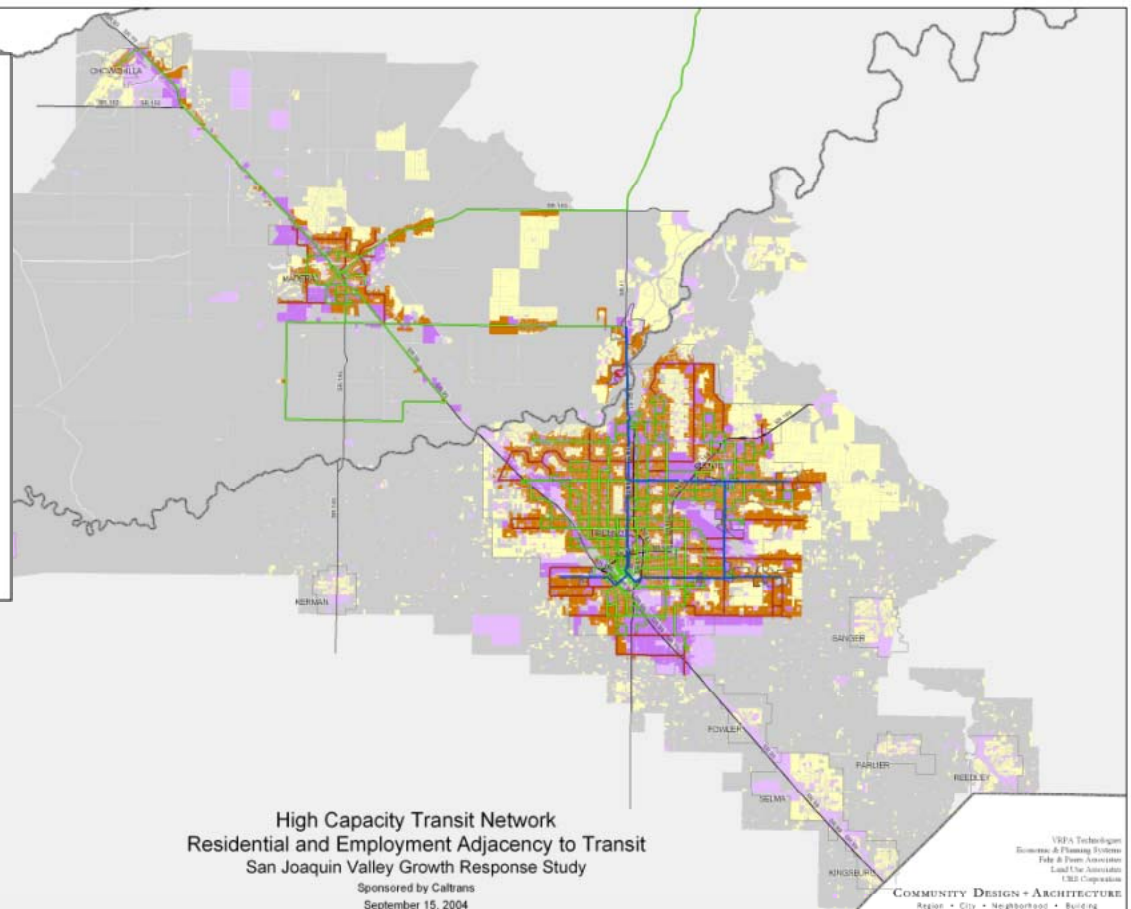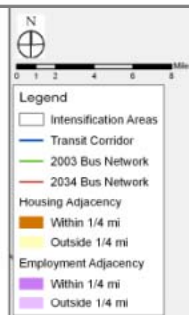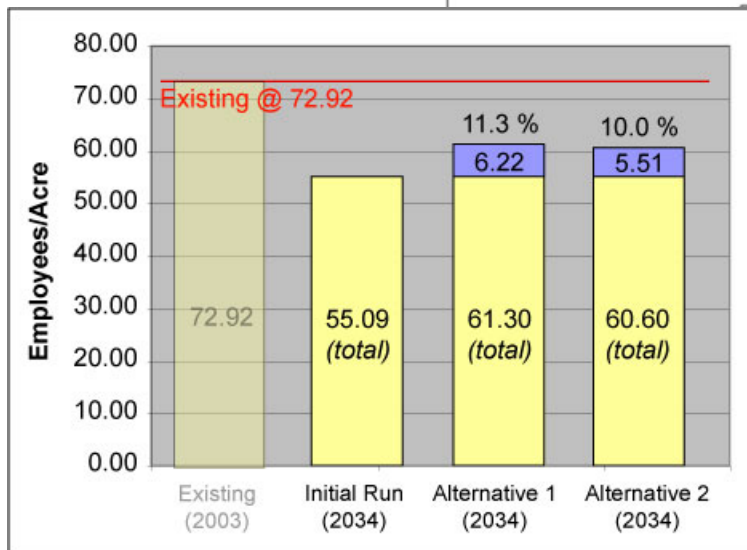
COMMUNITY DESIGN + ARCHITECTURE
Region • City • Neighborhood • Building
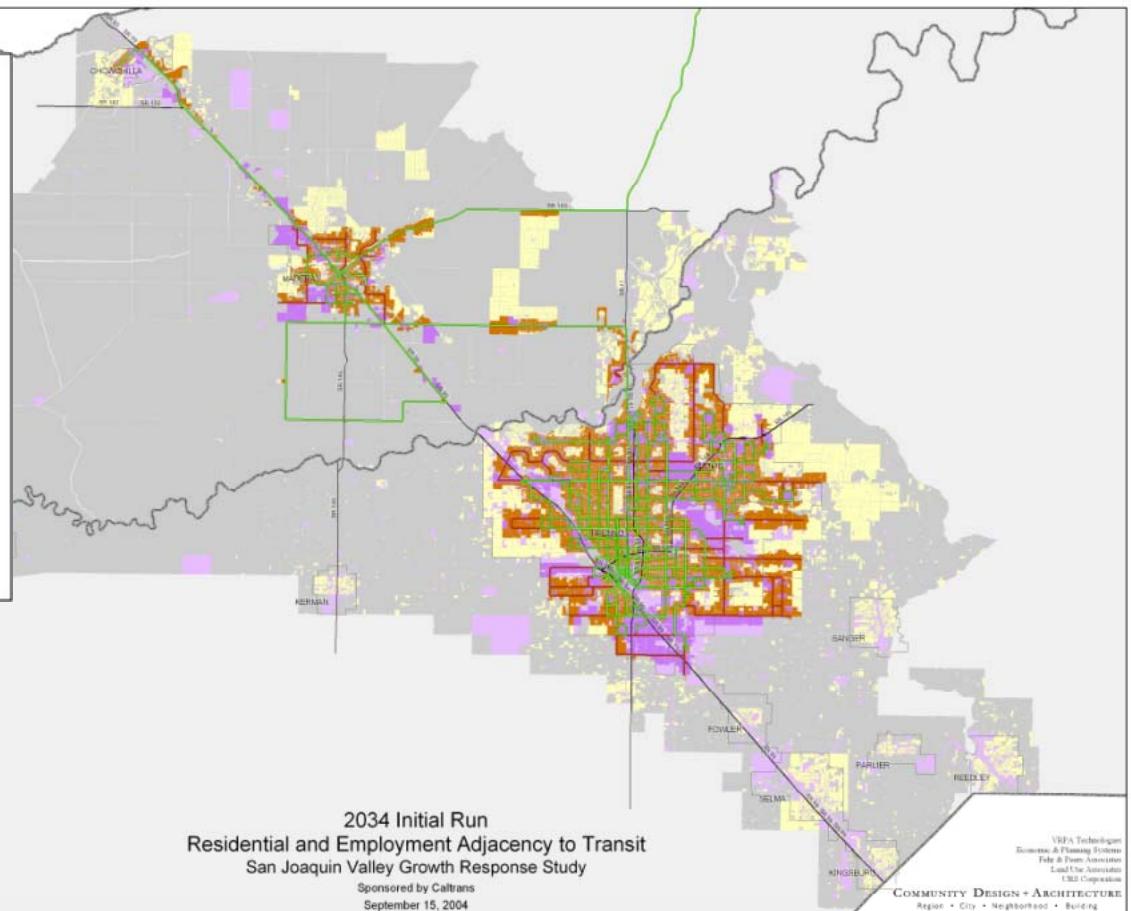
San Joaquin Valley Growth Response Study, Phase III

Transit Adjacency to Employment

Alternatives 1 and 2 vs. Initial Run

Employees/Acre

Existing @ 72.92

| | 11.3 % | 10.0 % |
| | 6.22 | 5.51 |

Existing (2003)	Initial Run (2034)	Alternative 1 (2034)	Alternative 2 (2034)
72.92	55.09 (total)	61.30 (total)	60.60 (total)

Legend
- Intensification Areas
- Transit Corridor
- 2003 Bus Network
- 2034 Bus Network

Housing Adjacency
- Within 1/4 mi
- Outside 1/4 mi

Employment Adjacency
- Within 1/4 mi
- Outside 1/4 mi

High Capacity Transit Network
Residential and Employment Adjacency to Transit
San Joaquin Valley Growth Response Study
Sponsored by Caltrans
September 15, 2004

COMMUNITY DESIGN + ARCHITECTURE
Region • City • Neighborhood • Building

Transportation Indicators

■ **Each Scenario was compared in terms of:**

- Vehicle Trips (VT)

- Vehicle Miles Traveled (VMT)

- Roadway Speeds

- Mode Split

Study Area Area Results by Scenario

INDICATOR:	Initial Run	Blackstone/41 (Alt 1) (vs. Initial Run)	BRT Network (Alt 2) (vs. Initial Run)
Vehicle Trips:	5,483,000	-2.0 %	-4.1 %
Vehicle miles:	45,139,000	-3.0 %	-3.6 %
Peak Auto Speeds			
--Fresno Roads:	18 mph	17 mph (-5.5%)	19 mph (+5.5%)
--Madera Roads:	28 mph	24 mph (-14.3%)	24 mph (-14.3%)
Transit Mode Split:	1.1 %	1.6% (+45 %)	1.6% (+45 %)

Interpreting the Bridge Constraint

- **Bay Bridge Congestion Levels In Fresno-Madera!?!**
  - Land Use is better balanced, but trip generation is higher in SR 41 Corridor (+65%, nearly half a million new vehicle trips under Alt. 1)
  - Model shows auto still the most convenient mode despite speeds of under 10 mph in the morning and afternoon peak periods.
  - Model projected Trans-Bridge Transit Mode Split of 5-7% may be low
    - Similar to 2020 transit mode split projection for Altamont Pass
    - Maximum likely split ~ 15% (midpoint of projected Altamont Pass and current Caldecott Tunnel transit shares)

TP+ and 4Ds

- **Summary Results:**
  - Most indicators are going in the expected direction: overall vehicle trips and vmt are down; transit ridership increases
  - Slower speeds in Madera County due to more development
  - Non-residential uses add more attraction trip ends (demand) in intensification zones than the residential uses added on the production end
  - Keeping employment and population levels at approximately the same for all alternatives has unintended effects

TP+ and 4Ds (Cont.)

- **Summary Results:**

  - **Blackstone/41 (Alternative 1) Scenario -** The concentration of intensification zones in the SR 41 corridor increases opportunities to walk and use transit, but also increases vehicular traffic and congestion in this corridor.

  - **BRT Network (Alternative 2) Scenario -** Wider dispersal of intensification zones in SR 41 corridor reduces vehicular traffic and congestion in the intensification areas.

Vehicle Trips

Daily Vehicle Trips

Legend: 2003, Initial Run 2034

Categories: Fresno County, Fresno Study Area (WhatIf Modeling), Madera County, Madera Study Area (WhatIf)
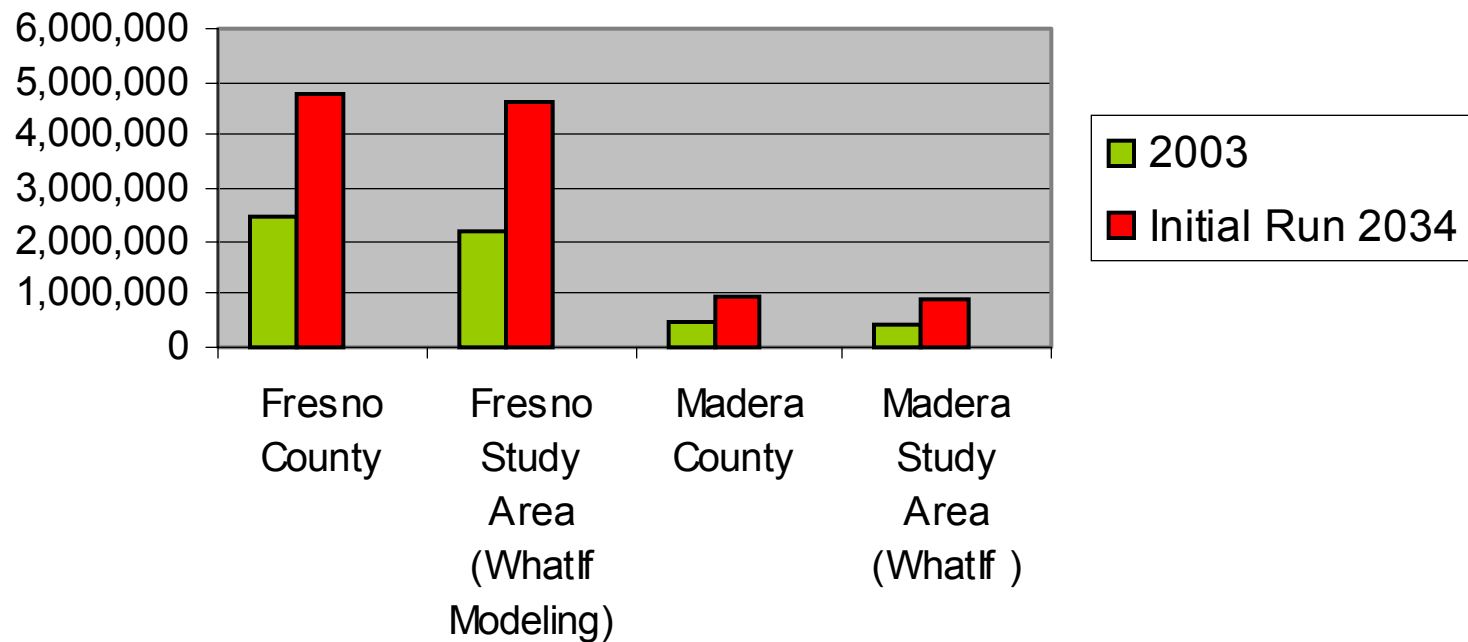
Vehicle Trips (Cont.)

Daily Vehicle Trips
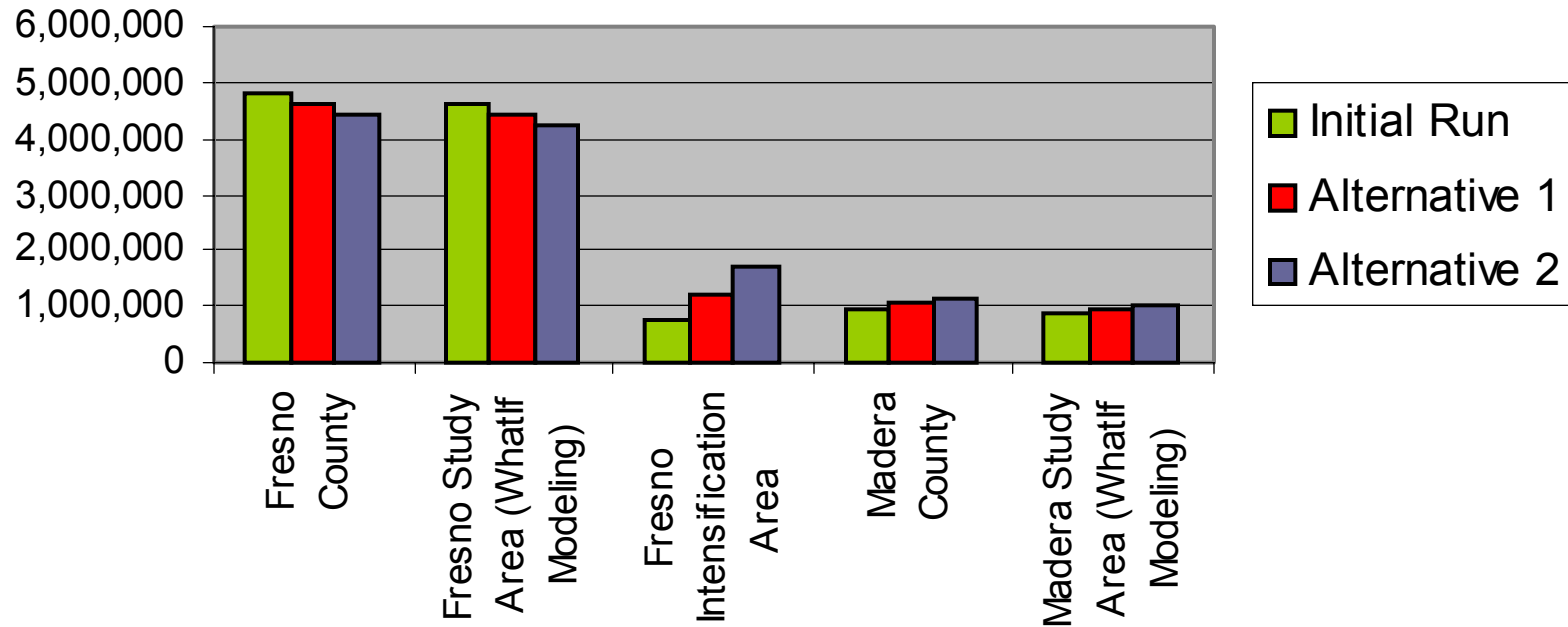
Vehicle Miles Traveled

Daily Vehicle Miles Traveled (VMT)

Legend:
- 2003
- Initial Run 2034

Categories: Fresno County, Fresno Study Area (WhatIf Modeling), Madera County, Madera Study Area (WhatIf Modeling)
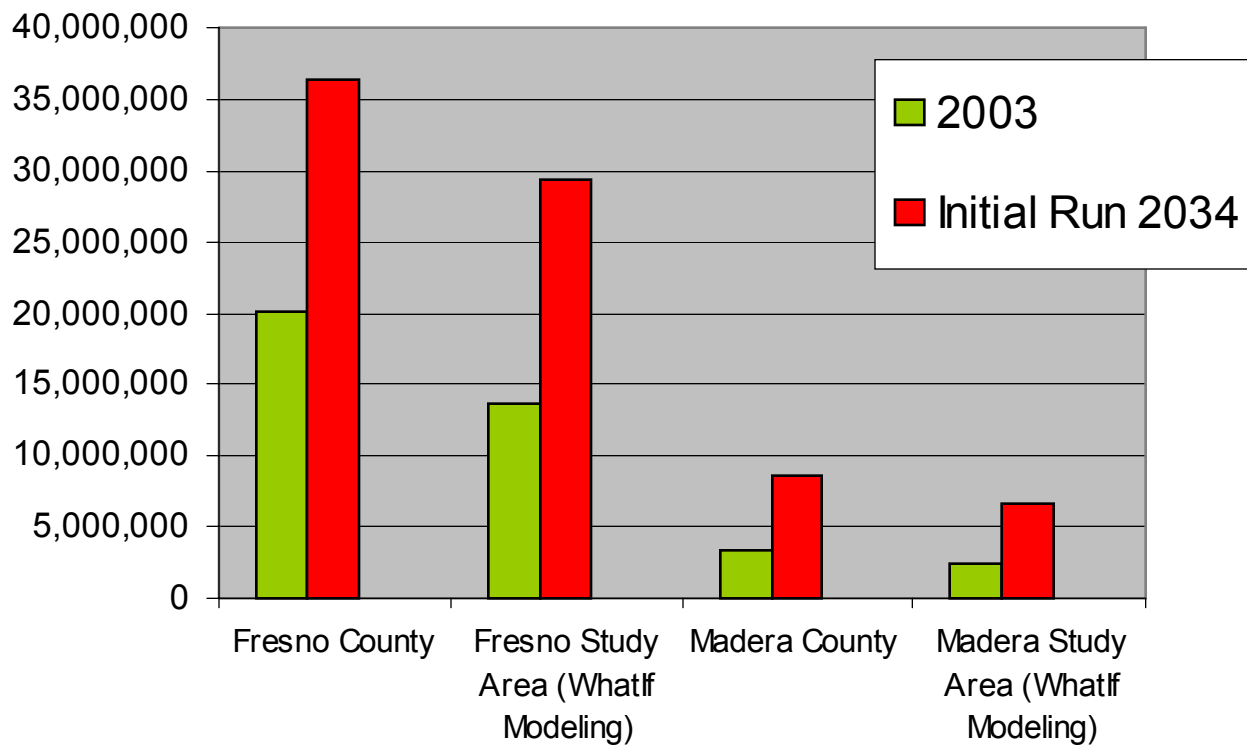
Vehicle Miles Traveled (Cont.)

Daily Vehicle Miles Traveled (VMT)
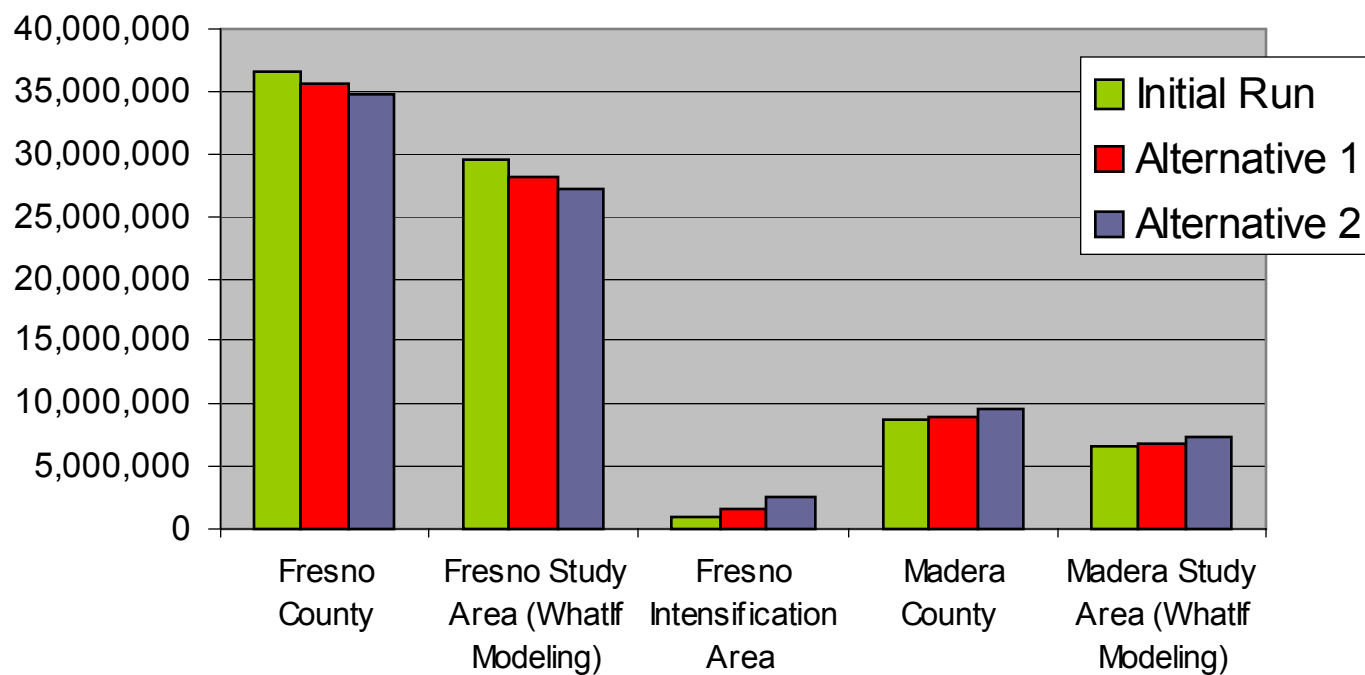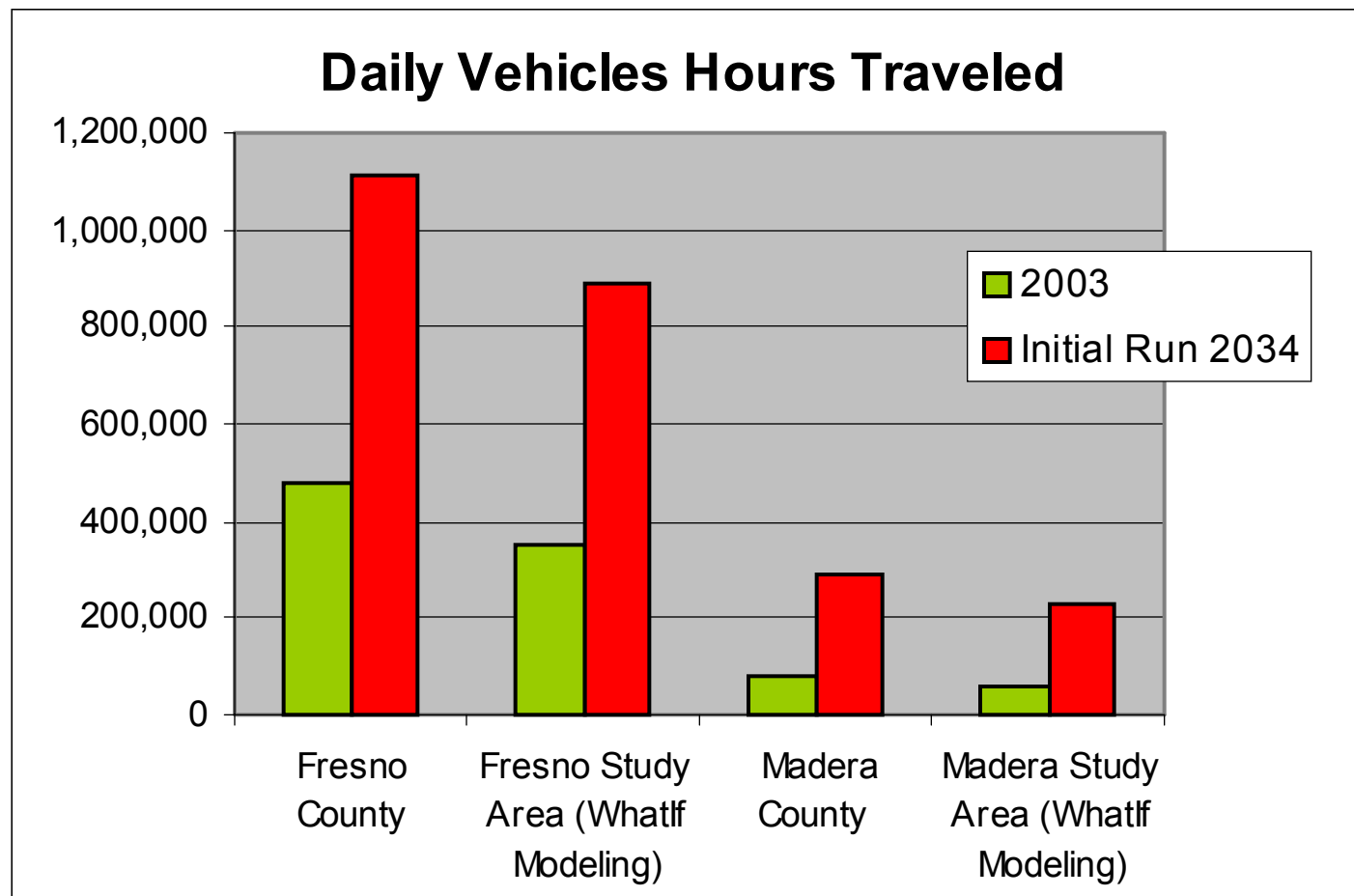
Vehicle Hours Traveled (Cont.)

Daily Vehicles Hours Traveled

Legend:
- Base Case
- Alternative 1
- Alternative 2

Categories:
- Fresno County
- Fresno Study Area (WhatIf Modeling)
- Fresno Intensification Area
- Madera County
- Madera Study Area (WhatIf Modeling)

Y-axis: 0 to 1,400,000
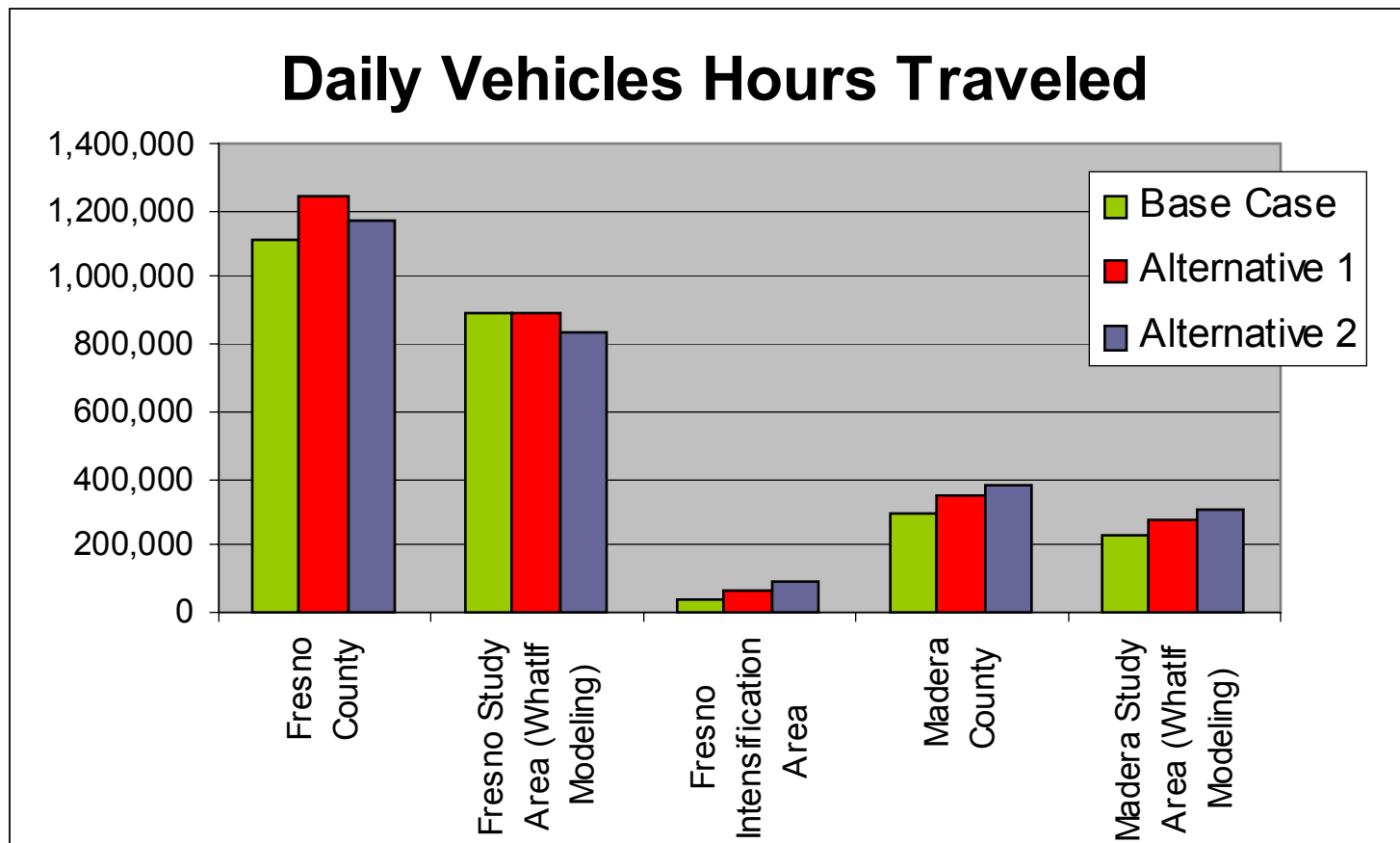
Economic Indicators

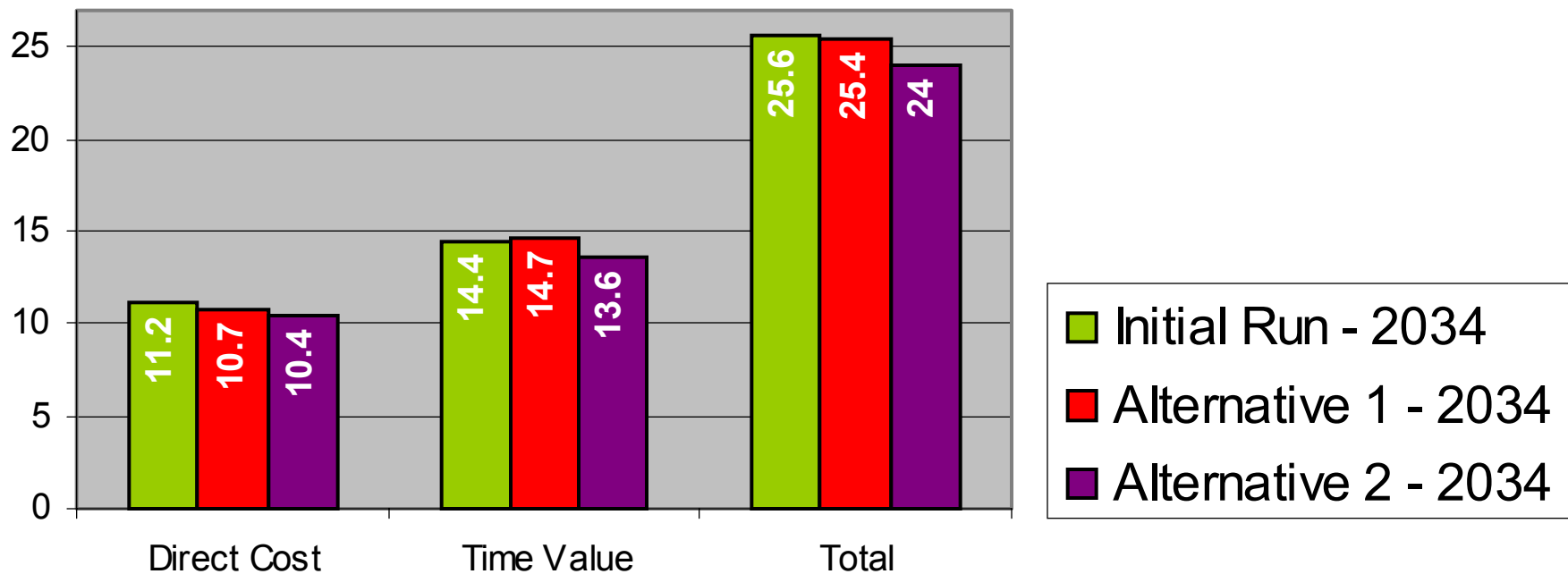- **Daily Transportation Costs**

- **Relative Infrastructure Costs**

- **Real Estate Development Costs**

Daily Transportation Costs (Fresno Co.)

Relative Infrastructure Costs (Study Area)
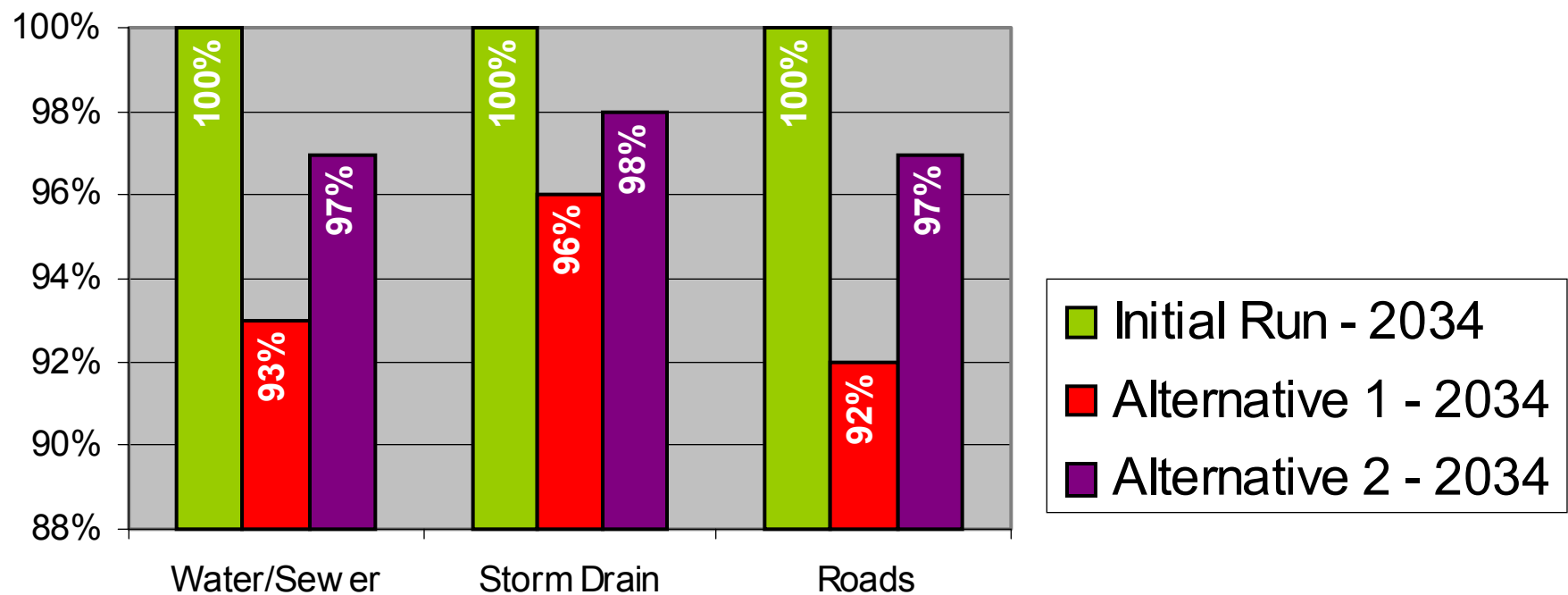
Real Estate Development Costs

Scenario	Standard Single Family		Intensification Area Housing
Direct Costs Cost per Unit Cost per SqFt	$175,000 $92.00		$115,000 $115.00
Infra/ Capital Cost per Unit Cost per SqFt	$10,000 $5.25		$3,300 $3.30
Total Costs Cost per Unit Cost per SqFt	$185,000 $97.25		$118,300 $118.30

San Joaquin Valley Growth Response Study, Phase III

Air Quality Indicator Results

Scenario	POP	VMT	Tons/Day			Lbs/Yr/Capita			Lbs/VMT		
			CO	ROG	NOX	CO	ROG	NOX	CO	ROG	NOX
2003 Base Year											
Fresno	855,743	20,076,000	489.8	79.6	67.8	417.9	67.9	57.8	0.0488	0.0079	0.0067
Madera	117,606	3,446,450	49.7	4.8	8.9	308.7	29.7	54.9	0.0289	0.0028	0.0051
TOTAL	973,349	23,522,450	539.6	84.4	76.6	726.6	97.6	112.7	0.0777	0.0107	0.0119
Initial Run - 2034											
Fresno	1,420,432	36,462,235	39.9	5.3	8.8	20.5	2.7	4.5	0.0022	0.0003	0.0005
Madera	306,380	8,677,118	11.2	1.4	3.7	26.8	3.4	8.9	0.0026	0.0003	0.0009
TOTAL	1,726,812	45,139,353	51.1	6.8	12.6	47.3	6.2	13.4	0.0048	0.0006	0.0013
Alt 1 - 2034											
Fresno	1,423,581	35,653,112	39.2	5.3	8.7	20.1	2.7	4.5	0.0022	0.0003	0.0005
Madera	301,971	8,938,910	11.5	1.5	3.8	27.8	3.5	9.2	0.0026	0.0003	0.0009
TOTAL	1,725,552	44,592,022	50.7	6.7	12.5	47.9	6.2	13.7	0.0048	0.0006	0.0013
Alt 2 - 2034											
Fresno	1,400,522	34,787,842	38.6	5.3	8.6	20.1	2.7	4.5	0.0022	0.0003	0.0005
Madera	337,897	9,585,887	12.1	1.5	4.0	26.1	3.2	8.6	0.0025	0.0003	0.0008
TOTAL	1,738,419	44,373,729	50.6	6.7	12.5	46.1	5.9	13.1	0.0047	0.0006	0.0013

Air Quality Indicator Results (Cont.)

Tons Per Day

Legend:
- 2003 Base Year (green)
- Initial Run - 2034 (red)

Categories: CO, ROG, NOX

Air Quality Indicator Results (Cont.)

Carbon Monoxide (CO)
Pounds / Year / Capita

47.3	Initial Run - 2034
47.9	Alt 1 - 2034
46.1	Alt 2 - 2034

Air Quality Indicator Results (Cont.)

Reactive Organic Gas (ROG) Pounds
Pounds / Year / Capita

	Initial Run - 2034	Alt 1 - 2034	Alt 2 - 2034
ROG Pounds/Year/Capita	6.2	6.2	5.9

Air Quality Indicator Results (Cont.)

Oxides of Nitrogen (NOX)
Pounds / Year / Capita
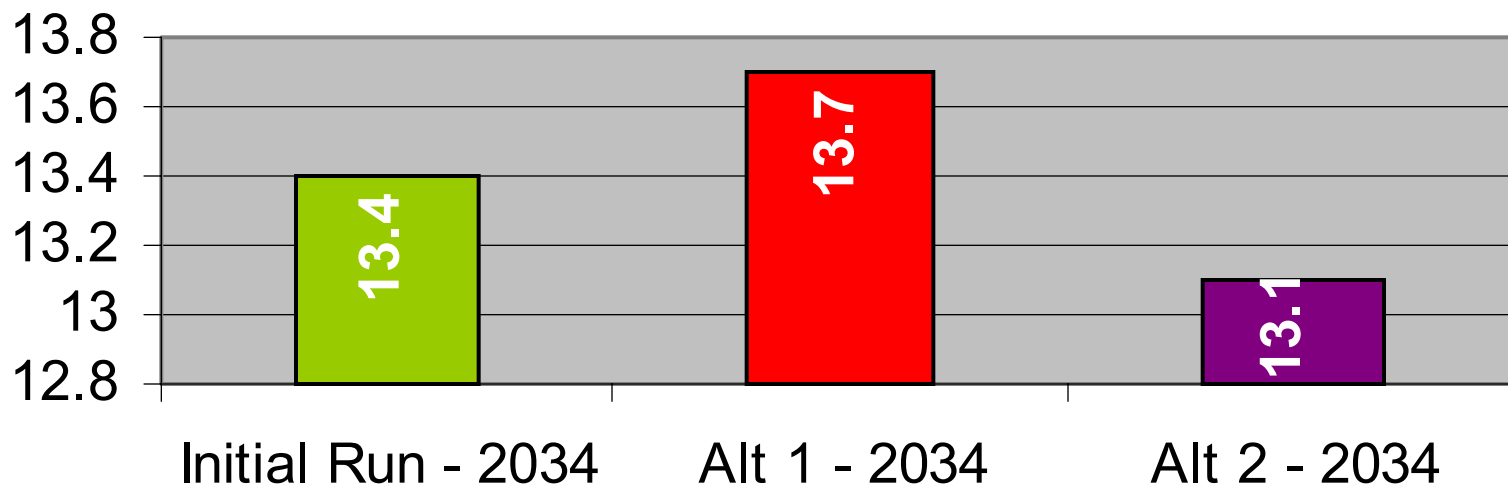
Model Benefits

- **Modeling tools provide a new level of analysis that can better inform land use and transportation decisions**
  - Allow stakeholders to evaluate growth scenarios at a large scale both visually and statistically with results that are not overly technical
  - New indicators can be evaluated more easily
  - INDEX provides input to 4-D process improving standard transportation models

- **Modeling tools encourage comprehensive and integrated planning approach**
  - Translation of land use policy to model inputs is more direct
  - Input requirements encourage more clarity in land use policies
  - Require higher-level of interaction between land use and transportation planners

Next Steps to Model Refinement

- **Modeling tools and data inputs need further refinement**
    - What If? and INDEX are new tools that are continuing to be developed and refined, similarly to early transportation modeling tools

- **Region and jurisdictions need to continue commitment to refining GIS data**
    - Will help future use of What If? and INDEX
    - Will be helpful as transportation modeling practices shift to GIS-based modeling packages

- **Bring land use designations into "alignment"**
    - Similar employment and residential densities from jurisdiction to jurisdiction
    - Provide more clarity in capacity for mixed-use designations
    - Verify employment densities

Potential Application of Tools

- **Test Additional Alternatives**
  - Increase employment and services in Madera County?
  - Refine transit corridors to better link growing employment areas to denser residential neighborhoods?
  - Increase employment densities to reflect market and transition some employment designations to housing and services?

- **Possible Next Applications:**
  - Caltrans SR 41 Corridor Study – City of Fresno and Caltrans to undertake a micro scale analysis using the Tool Box
  - City of Fresno General Plan Implementation Program – Activity Center Analysis
  - Downtown Fresno Transportation Study
  - Public Transportation Infrastructure Study (PTIS)

Your Modeling Ideas

- **What would you like to see these tools used for –**

  - Additional micro-scale analysis of new developments?

  - Test additional alternative scenarios at the "regional" level?

  - To test the RTP and other Circulation Plans and Studies?

  - Assess residential access to services?

Closing

- **Thank you for attending and participating!**

- **For additional information contact:**

  Georgiena Vivian at (559) 259-9257 or gvivian@vrpatechnologies.com

  Web Site: www.vrpatechnologies.com

- **The Phase III Report will be available in November**

  Web Site: www.dot.ca.gov/dist6/projects.htm

The "Tool Box" will be housed at Fresno COG and at the Madera County Transportation Commission (MCTC)

Special Thank You

- **Special thank you to:**
  - Darrell Unruh, Fresno Development Dept.
  - Jon Elam – Fresno Public Works
  - John Downs – Fresno Area Express
  - John Wright – Clovis Planning & Development Services
  - Lynn Gorman – Fresno County Public Works Dept.
  - Tony Boren and Mike Bitner – Fresno COG
  - Derek Winning – MCTC
  - Stakeholders!

Questions and Answers